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Close-Out Radiological Survey Plan For The 123 Cluster

Rocky Mountain Remediation Services, L. L. C.

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**CLOSE-OUT RADIOLOGICAL SURVEY PLAN
FOR THE 123 CLUSTER**

REVISION 1

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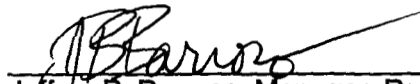
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CLOSE-OUT RADIOLOGICAL SURVEY PLAN

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CLOSE-OUT RADIOLOGICAL SURVEY PLAN FOR THE 123 CLUSTER

1.0 PURPOSE

The purpose of the Close-Out Radiological Survey Plan (CRSP) is to define the methods for collecting, analyzing, and documenting data to demonstrate that residual radioactive material existing in Buildings 123, 113 and 114 are below levels established in the *Final Rocky Flats Cleanup Agreement* (RFCA) identified in Appendix A, (Figure IV-1, Surface Contamination Guidelines, Department of Energy (DOE) 5400 5, 2-8-90). Those areas that contain radioactive material above the unrestricted release criteria will be decontaminated to meet the release criteria, managed as radioactive material or released in a restricted manner.

2.0 DESCRIPTION

2.1 FACILITY HISTORY

2.1.1 Building 123

Building 123 is located on Central Avenue between Third and Fourth Streets. The original building has been in use since construction in 1953, with additions completed in 1968, 1972, and 1974. The general areas of the building and respective approximate construction dates are

- East and North Wing (Rooms 100-135) - 1952
- Addition to East Wing (Rooms 139-151) - 1968
- West Wing (Rooms 154-163) - 1972
- Addition to East Wing (Room 165) - 1974

Currently, the 75-room, single-level facility covers approximately 19,000 square feet and is constructed on grade with approximately fourteen- (14-) foot ceilings. Construction material is mostly concrete with an asphalt roof. Modifications have been made to the building interior after the original construction of each area. Areas have been remodeled including installation and removal and partition walls, laboratory fixtures and other items. Sections of piping have been installed, removed and modified during the life of the facility.

Building 123 was one of the first ten buildings constructed at Rocky Flats. Analytical laboratory, dosimetry and instrument calibration activities have been conducted in Building 123 since construction in 1953. Building 123 also provided office space for radiation health specialists, storage for all radiological health records, a laboratory for calibration and repair of criticality alarms and other repair/calibration shops. Building 123 once housed medical research until such operations were relocated to Building 122.

The analytical laboratory analyzed environmental (air, water, soil, and vegetation), biological (urine, fecal matter, and nasal mucous), health physics (room air), and industrial hygiene samples (beryllium and organic vapors in room air). The Health Physics Instrumentation Section repaired and calibrated radiation-detection instruments. The External Dosimetry Section processed thermoluminescent dosimeters and film badges. The Radiological Records Section maintained occupational radiation exposure and dose records for radiation workers.

The analytical laboratory procedures involved the digestion of samples to purify and concentrate the radiological constituents. Various sample waste and rinse solutions were washed down the process drain for subsequent treatment in Building 774 (Building 374 after 1983). Liquid organic wastes were containerized in special bottles and stored in satellite accumulation areas prior to

transfer to the RCRA 90-day storage building and eventual shipment to Liquid Waste Operations. Wastes generated in Non-Radioactive Material Management Areas and monitorable lab trash were deposited in dumpsters for disposal in the Rocky Flats Environmental Technology Site (RFETS) landfill.

2.1.2 Building 113

Building 113 is a guardhouse that has been converted into office space. The building encloses approximately 200 square feet. It is constructed of concrete with a flat roof. Building 113 is similar to the four other guardhouses that have already been removed from RFETS.

2.1.3 Building 114

Building 114 is a small shelter used by RFETS employees as a waiting area for off-site transportation. The building encloses approximately 25 square feet. It is constructed of masonry blocks with a flat roof. There are no utilities associated with this building, and records indicate the building has served no other function.

2.1.4 Building 123S

Building 123S is a metal shed on a concrete slab. It was formerly used as a RCRA 90-day storage area and as a Radioactive Material Storage Area. The 123 Cluster Demolition Project includes the removal of this building, however, since this building is considered property, it will be released for unrestricted use in accordance with Health and Safety Practice (HSP) Site Procedure 1-P73-HSP-18.10, *Radioactive Material and Unrestricted Release of Property and Waste* and will be excluded from the CRSP for the 123 Cluster.

3.0 SCOPE OF DECOMMISSIONING CLOSE-OUT RADIOLOGICAL SURVEYS

The surveys for Buildings 123, 113 and 114 will include floors, interior wall surfaces, accessible surfaces of the roof, exterior wall surfaces and fixed equipment.

The scope of Building 123 Decommissioning Project CRSP as defined in this document is to:

- Provide a description of the graded approach used in determining the intensity of sampling and survey data gathering which must be obtained to make the determination that Buildings 123, 113 and 114 meet the release criteria of Appendix A.
- State how the characterization data obtained will be used to support the final decommissioning decision.
- Develop a survey and sampling approach which, when implemented, will obtain information to adequately demonstrate that Buildings 123, 113 and 114 have no contamination levels above the unrestricted release levels stated in Appendix A.
- State the criteria which will be used to release Buildings 123, 113 and 114 for unrestricted use.

The 123 Cluster Demolition Project does not include building slabs or the abandoned source wells. Prior to building demolition, residual radioactivity identified in the slab or source wells will be remediated or immobilized so that there is no removable contamination in excess of the release criteria identified in Appendix A. The Building 123 slab and source wells are excluded for the 123 Cluster CRSP and will then be dealt with at a later date.

4.0 FINAL SURVEY STRATEGY

4.1 IDENTIFYING THE POTENTIAL FOR RESIDUAL RADIOACTIVITY AND CONTAMINANTS OF CONCERN

4.1.1 Building 123

During the past forty-four (44) years, building operations (primarily analytical laboratory operations) may have contributed to the deposition of varying degrees of radioactive contamination within the building. The presence of radioactive contamination above the unrestricted release criteria was confirmed in Rooms 105, 106, and 109 during the reconnaissance level characterization surveys of the building. The potential for undetected residual radioactivity in excess of the release criteria varies throughout the building. Area classification and the extent of final surveys weigh heavily on this potential.

Determination of the contaminants of concern for Building 123 was accomplished through, (1) a review of historical records (2) interviews with past and present RFETS employees having first hand knowledge on the processes that had taken place during the building's history, (3) waste characterization reports and (4) in-situ gamma spectroscopy.

Interviews with employees revealed that a cesium spill had occurred in Room 109 and undocumented thorium research was performed in Room 105. Scoping surveys revealed elevated levels of radioactivity in both areas. In-situ gamma spectroscopy confirmed the presence of cesium and thorium. Refer to Summary Report of In-Situ Gamma Spectroscopy for Building 123 for analysis results.

The following contaminants have been identified for Building 123:

- Pu-242, Pu-239, U-232, U-234, U-238, Am-241 and Cm-244, radioactive tracers used during bioassay analysis
- Cs-137, spill, Room 109, confirmed via in-situ gamma spectroscopy
- Th-232 and associated decay products, research and development Room 105, confirmed via in-situ gamma spectroscopy

The following isotopes mentioned in the Reconnaissance Level Characterization Report for Building 123 have been ruled out as potential contaminants of concern:

- H-3, in the form of HTO in concentrations up to 1000 dpm/ml used as a standard for liquid scintillation analysis. A review of the Historical Release Report for the Rocky Flats Plant, Manual No. 21100-TR-12501-01 and interviews with past building occupants failed to identify spills or releases involving tritium. If an undocumented spill had occurred, it is highly unlikely that residual tritium contamination would exceed the release criteria because the process of evaporation and relatively short half-life would limit the resulting contamination levels.
- H-3, in the form of HT gas is not expected to result in surface contamination.

- Ni-63, Sr-90, Ba-133, Gd-148, Pb-210 and Cf-250 in the form of electroplated and sealed check sources. The integrity of electroplated and sealed sources are verified semi-annually in accordance with HSP 1-P21-HSP-18 04, *Control of Radioactive Sources* and are not expected to result in radioactivity contamination of the building. Additionally, the DCGL_w for alpha and beta contamination identified for final surveys are at least as restrictive as the release criteria for these radionuclides.

4.1.2 Building 113

Process history was used in lieu of scoping surveys for the classification of Building 113. Based on the past and current use, Building 113 is not expected to contain any residual radioactivity and has been designated as Class 3.

4.1.3 Building 114

Process history was used in lieu of scoping surveys for the classification of Building 114. Based on the past and current use, Building 114 is not expected to contain any residual radioactivity and has been designated as Class 3.

4.2 SURVEY GROUPS

4.2.1 Definition

As referenced in this CRSP, a Survey Group is defined as an area or collection of areas which have a common history or other characteristics, or are naturally distinguishable from other portions of the site. Survey Groups are partitioned into one or more Survey Units (Section 4.3). Twenty-eight Survey Groups have been identified for the 123 Cluster.

4.2.2 Purpose

Survey Groups have been identified for the 123 Cluster to (1) facilitate survey design, (2) tracking Final Survey status and (3) to organize collected survey data.

Because the potential for residual contamination may vary throughout an area, interior areas comprising a Survey Group may be subdivided into separate Survey Units. The exteriors of Bldgs 123, 113 and 114 are not subdivided. It is assumed that any residual radioactivity external to each building would have been deposited uniformly across each external plane as a result of a release of radioactivity elsewhere onsite.

The methodology behind this grouping is not described in the Multi-Agency Radiation Survey and Site Investigation Manual (MARSSIM) or NUREG/CR-5849, but has been developed for this project in an effort to aid in the final decision process.

4.3 SURVEY UNITS

4.3.1 Definition

As referenced in this CRSP, a Survey Unit is defined as a subdivision of a Survey Group which has a similar potential for residual radioactivity based on process history and/or survey data. Fifty-six Survey Units have been identified for the 123 Cluster.

4.3.2 Purpose

Survey units have been identified for the 123 Cluster to assure that the number of survey data points for a specific site are relatively uniformly distributed among areas of similar contamination potential.

4.3.3 Limitations

As recommended by MARRSIM, survey units have been limited in size to ensure each area is assigned an adequate number of data points. The suggested maximum areas for survey units are 100 m² for Class 1 areas and 1000 m² for Class 2 areas. There is no size limit for Class 3 areas. Special consideration is given to Survey Units of less than 10 m². In this case, the number of data points obtained from statistical tests are unnecessarily large and not appropriate for smaller survey units.

4.4 CLASSIFICATION

4.4.1 Definition(s)

Non-impacted Area. Areas that have no reasonable potential for residual contamination.

Class 1 Area. Areas that have, or had, a potential for radioactive contamination (based on site operating history) or known contamination (based on previous radiation surveys) above the DCGL_w.

A survey unit has been designated Class 1 if (1) Scoping/characterization surveys identify radioactive contamination in excess of the DCGL_w and/or, (2) based on process history, there is a potential for radioactive contamination in excess of the DCGL_w.

Class 2 Area. Areas that have, or had, a potential for radioactive contamination or known contamination, but are not expected to exceed the DCGL_w.

A survey unit has been designated Class 2 if (1) Scoping/characterization surveys failed to identify radioactive contamination in excess of the DCGL_w, and (2) based on process history, radioactive contamination may be present but is not expected to exceed the DCGL_w.

Class 3 Area. Any impacted areas that are not expected to contain any residual radioactivity, or are expected to contain levels of residual radioactivity at a very small fraction of the DCGL_w, based on site operating history and previous radiation surveys.

A survey unit has been designated Class 3 if (1) Scoping/characterization surveys failed to identify radioactive contamination, and (2) based on process history, radioactive contamination may be present but at levels which are a small fraction of the DCGL_w.

4.4.2 Purpose

As previously mentioned, the potential for undetected residual radioactivity in excess of the release criteria varies throughout the building. Area classification and the extent of final surveys weigh heavily on this potential. Results of the scoping and characterization surveys, summarized in the Reconnaissance Level Characterization Report for Building 123, were reviewed along with the process history to determine the classification for a given survey unit.

The internal portions of the potable water, fire main and steam systems have been designated as non-impacted. These systems are supplied with a clean pressurized water source, there is no reasonable potential for these systems to have become contaminated. In addition, there are several pressurized gas systems (air, N₂, Ar and natural gas) which served Building 123, because these systems were operated at pressures exceeding atmospheric, there is no reasonable potential for these systems to have become contaminated. The process cold water system and health physics vacuum system will be investigated and dispositioned in accordance with Site Procedure 1-P73-HSP-18 10, *Radioactive Material Transfer and Unrestricted Release of Property and Waste*.

All impacted designations referenced by MARSSIM have been applied to areas within Building 123. Buildings 113 and 114 are designated as Class 3, no distinction is drawn above and below 2 meters.

It is assumed that if radioactive contamination exists on the exterior of the buildings, it would have been deposited as a result of a release from a process facility and would have been evenly distributed across the surface of the building. The exterior portions of Buildings 123, 113 and 114 are not expected to contain any residual radioactivity, therefore, these areas have been designated as Class 3.

Survey densities for MARSSIM Class 1 and 3 are at least as conservative as the affected and unaffected designations described in NUREG/CR-5849, respectively. The scan frequency of a MARSSIM Class 2 area is less restrictive than that prescribed for an affected area because the potential for residual radioactivity above the release criteria is not as great as that for a Class 1 area. Class 2 fixed and removable survey requirements meet the affected area criteria.

Initial classifications of areas may be changed during characterization and in-process surveying based on survey results and sound engineering judgement by Radiological Engineering. Survey densities are summarized below.

4.4.3 Survey and Sampling Requirements

Impacted Class 1 A minimum of one fixed alpha and beta total surface activity measurement for each one square meter (nine square feet), with no less than 45 sample locations per survey unit, unless otherwise specified in the Survey Unit Final Survey Instructions.

A minimum of one alpha and beta removable activity measurement for each one square meter (nine square feet), with no less than 45 sample locations per survey unit, unless otherwise specified in the Survey Unit Final Survey Instructions.

A 100% alpha and beta scan will be performed on accessible surfaces.

Impacted Class 2 One fixed alpha and beta total surface activity measurement for each one square meter (nine square feet), with no less than 45 sample locations per survey unit, unless otherwise specified in the Survey Unit Final Survey Instructions.

One alpha and beta removable activity measurement for each one square meter (nine square feet), with no less than 45 sample locations per survey unit, unless otherwise specified in the Survey Unit Final Survey Instructions.

A 75% alpha and beta scan will be performed on accessible surfaces.

Impacted Class 3 One fixed alpha and beta total surface activity measurement every 50 m² with no less than 45 sample locations per survey unit, unless otherwise specified in the Survey Unit Final Survey Instructions.

One fixed alpha and beta total surface activity measurement every 50 m² with no less than 45 sample locations per survey unit, unless otherwise specified in the Survey Unit Final Survey Instructions

A 10% alpha and beta scan based on total survey surface area will be performed on selected biased locations

Non-impacted No survey requirements

5.0 UNRESTRICTED RELEASE OF THE 123 CLUSTER

5.1 RADIOLOGICAL RELEASE CRITERIA

The unrestricted release criteria are presented in Appendix A. Plutonium-239 is the most limiting alpha emitting contaminant common to all survey units identified in the 123 Cluster. In addition to meeting the release criteria for transuranics, survey data obtained on the external surfaces of Buildings 123, 113 and 114 and the interior surfaces of Buildings 113 and 114 will be verified less than the beta-gamma release criteria. In addition to meeting the release criteria for transuranics, survey data obtained from the interior survey units of Building 123 will be verified less than 75% the release criteria for Thorium-232 (beta) (Reference Kaiser-Hill Memo 97-RF-05729, Appendix D). As a result of a Cesium-137 spill, Survey Group 15 consisting of Rooms 109, 109A and 109B of Building 123 will also be verified less than the release criteria for beta-gamma emitters. External gamma radiation measurements will not be performed during final surveys because the 123 Cluster is slated for demolition (Reference Section IV 4 c of DOE Order 5400.5). Volume contaminated material will be evaluated against the DOE No-Rad-Added Program. The survey methods and release criteria of Appendix A are in conformance with the following RFETS procedures

4-K62-ROI-03 01	<i>Performance of Surface Contamination Surveys</i>
4-S23-ROI-03 02	<i>Radiological Requirements for Unrestricted Release</i>
4-Q97-REP-1003	<i>Radiological Evaluation for Unrestricted Release of Property/Waste</i>
1-P73-HSP-18 10	<i>Radioactive Material Transfer and Unrestricted Release of Property and Waste</i>

5.2 EVALUATING AREAS OF ELEVATED ACTIVITY

Individual measurement results will be compared against the average and the maximum release criteria in Appendix A. Measurement results less than the average guideline value will be deemed acceptable. Measurement results greater than the maximum guideline value will indicate a need for remediation. Measurement results greater than the average guideline value but less than the maximum release criteria will require investigation to determine if the average of that measurement along with eight additional measurements in one square meter (centered about the original measurement) exceeds the average release criteria. These eight measurements will be obtained as follows, a 3X3 array of sample points will be taken with the elevated measurement at the center and all points will be spaced 0.25 meters apart. If the average of these measurements exceed the average guideline value, remediation will be necessary. If the average of these measurements are less than the average guideline value, no further action will be necessary.

6.0 SITE ASSESSMENT

6.1 SEVEN STEP DATA QUALITY OBJECTIVE PROCESS

The following seven step process derived from Environmental Protection Agency (EPA) QA/G-4, *The Data Quality Objective Process* and the Draft MARSSIM is being utilized to develop a CRSP for the 123 Cluster. The CRSP was designed to identify the survey requirements which, when completed, will demonstrate compliance with the Appendix A release criteria. A portion of these survey requirements have been met by In-Process characterization surveys.

Step 1

Why perform this survey?

This survey is being performed to assure that Buildings 123, 113 and 114 materials to be released contain no radioactive contamination above the unrestricted release criteria outlined in Appendix A.

What types and kind of sampling measurements are required?

The radiological surveys required to assure that the unrestricted release criteria is met are fixed and removable surveys for both gross alpha and gross beta contamination. These surveys are performed at distinct locations throughout the buildings.

Since small areas of radioactive material may be present between the fixed and removable surveys, scan surveys will also be performed. These surveys are performed across defined areas of the buildings.

Building media samples will be obtained at distinct locations to verify building materials are free of residual radioactive resulting from DOE operations.

Who needs the information?

DOE, EPA, Colorado Department of Public Health and the Environment, Stakeholders, Kaiser-Hill, Safe Sites of Colorado and Rocky Mountain Remediation Services will use the CRSP results to assure that, following demolition, the building rubble can be released in an unrestricted manner.

When is the information needed?

The survey results from the CRSP are needed before the demolition of Building 123, 113 and 114.

Step 2

What decisions will be made from this final survey information?

Structures and components of the 123 Cluster will be released in an unrestricted manner when it is shown that the criteria identified in Appendix A are met.

If the surveys show that portions of the 123 Cluster do not meet the unrestricted release criteria, the area exceeding the criteria will be decontaminated or removed. The decontaminated area will then be resurveyed to assure that the unrestricted release criteria is met. If the unrestricted release criteria cannot be met, the area exceeding the criteria will not be released for unrestricted use. In the event of slab contamination a temporary cover will be placed over the affected area that will protect the area from damage during demolition and removal of rubble.

Are there any alternatives to the decision?

There are no other alternatives for the 123 Cluster. The Site Utilization Review Board and DOE Management have made the decision that these buildings are excess.

What is the end use of the equipment, facility or structure (free release, restricted use, low-level waste, etc.)?

Structures and components within Building 123 which have no radioactive material contamination above the unrestricted release criteria, may be released for unrestricted use. Materials shown to contain radioactive material above the unrestricted release criteria which are not decontaminated, will be disposed of as low-level waste. It is not anticipated that materials with residual radioactivity in excess of the release criteria will be released for restricted use.

Step 3

What information is required to make this decision?

The information required are the radiological survey data and building media sample results that will support a decision to release the building materials and fixtures for unrestricted use. Fixed and removable surveys for both gross alpha and gross beta contamination are required. These surveys are performed at distinct locations within the building. Since radioactive material may be present between the locations where fixed and removable surveys will be taken, scan surveys will also be performed. These scan surveys are performed so that the probability of finding radioactive material above the unrestricted release criteria is maximized. These scan surveys are performed across a defined area within the building. Refer to Appendix C for survey instructions.

What source(s) can be used to obtain the information?

Reconnaissance level characterization surveys and in-process characterization surveys. If these surveys do not satisfy the requirements of the CRSP, additional surveys will be required so that the requirements of the CRSP are met.

Can the desired analyses be performed at RFETS or will the analysis be sent off-site?

All radiological survey data will be obtained and recorded within the building by qualified radiological control technicians. This data will be reviewed at RFETS. Building media samples may be analyzed on-site or sent off-site for analysis by a qualified laboratory.

What type of instrumentation will be required?

The following instrumentation will be used to perform all radiological surveys. The Minimum Detectable Activities (MDA) of the instruments used to perform the surveys required in this CRSP will be a fraction of the unrestricted release criteria outlined in Appendix A. A goal will be to have the MDA of an instrument at or below 50% of the unrestricted release criteria.

Instrument	Count Time	Max Background	Application	MDA (dpm/100 cm ²)
Bicron w/A100 Probe	60 sec	2 cpm	Direct Alpha Surveys (Total Alpha Activity)	55
Bicron w/B50 Probe	60 sec	250 cpm	Direct Beta Surveys (Total Beta Activity)	610
NE Electra w/ DP6 Probe	60 sec	2 cpm alpha 700 cpm beta	Direct Alpha and Beta Surveys (Total Activity)	60 455
SAC-4	120 sec	1 cpm	Removable Alpha Swipes	<12
Tennelec Series 5	120 sec	1 cpm alpha 10 cpm beta	Simultaneous Removable Alpha and Beta Swipes	*
BC-4	60 sec	200 cpm	Removable Beta Swipes	205

* The MDA for this instrument is calculated on a daily basis and is dependent on the calibrated efficiency and daily background check. Typical alpha and beta MDA values for a two minute count are <7.5 dpm/100 cm² and <10 dpm/100 cm² respectively.

Has facility structural data been reviewed?

Structural data is not applicable to this CRSP since the building is slated for demolition.

What suspect materials have been identified?

Plutonium, Americium, Uranium, Thorium, Curium and Cesium have been identified as radioisotopes that may be present in Building 123.

Step 4

What is the scope of this final survey?

The interior floors, walls, ceilings and fixed equipment inside Buildings 123, 113 and 114 will be surveyed. The extent of these surveys will vary throughout the buildings and will be dependent on the potential for residual radioactivity. The exterior walls and roofs of the buildings will be surveyed. Building media samples will be obtained as needed to determine the presence of residual radioactivity. Residual radioactivity in the building slab, source wells, and surrounding soils will be evaluated and remediated, if necessary at a later date.

What is the sample population of interest?

The floors, walls, ceiling and fixed equipment located within the interior of the building and the exterior walls of the building are the population of interest.

What kind of radiological hazard is being evaluated?

Radioactive material present on the surface that is fixed and/or removable needs to be evaluated. Gross alpha and gross beta measurements will be taken to evaluate the radiological hazard. Additionally, radioactive material that may have migrated into or sealed over needs to be evaluated. Building media samples will be obtained and analyzed for gross alpha and beta radioactivity and isotopically as necessary.

Are there any constraints on data collection?

Data collection is performed in accordance with the requirements of

NUREG/CR-5849 - *Manual for Conducting Radiological Surveys in Support of License Termination*

Draft MARSSIM - *Multi-Agency Radiation Survey and Site Investigation Manual*

The survey methods utilized are in conformance with specific sample analysis plans and the following RFETS procedures

4-K62-ROI-03 01 *Performance of Surface Contamination Surveys*

4-S23-ROI-03 02 *Radiological Requirements for Unrestricted Release*

4-Q97-REP-1003 *Radiological Evaluation for Unrestricted Release of Property/Waste*

1-P73-HSP-18 10 *Radioactive Material Transfer and Unrestricted Release of Property and Waste*

What sample measurement locations (densities) are necessary to get the desired certainty?

All areas of the building cluster do not have the same potential for radioactive material being present and, therefore, do not require the same level of survey coverage to achieve an appropriate level of confidence that building surfaces satisfy the unrestricted release criteria. The CRSP is designed so that areas with higher potential for contamination receive a higher degree of survey effort. This will ensure that the CRSP is both effective and efficient.

The following area classifications with their associated survey frequencies are based on guidance from:

NUREG/CR-5849 - *Manual for Conducting Radiological Surveys in Support of License Termination*

Draft MARSSIM - *Multi-Agency Radiation Survey and Site Investigation Manual*

Four area classifications were used to design the 123 Cluster CRSP. These classifications are defined as follows:

Impacted Class 1. Are areas that have potential contamination (based on building operating history) or known contamination (based on past or preliminary characterization survey data). This would normally include areas where radioactive materials were used and stored and where records indicate spills or other unusual occurrences could have resulted in the spread of contamination. The survey frequency will be determined utilizing MARSSIM statistical calculations and professional judgment. In addition, an alpha/beta scan survey of 100% of the applicable surface areas, including fixed equipment, is required.

Impacted Class 2. Are areas that have or had a potential for radioactive contamination or known contamination, but are not expected to exceed the applicable contamination limits. The survey frequency will be determined utilizing MARSSIM statistical calculations and professional judgment. In addition, a scan survey for alpha and beta of 75% of the applicable surface areas, including fixed equipment, will be performed as directed by Radiological Engineering Personnel.

Impacted Class 3. Are all areas not classified as Class 1 or Class 2 Impacted or Non-Impacted. These areas are not expected to contain residual contamination above the applicable limits, based on knowledge of building history and previous survey information. However, insufficient documentation is present to exclude the area from survey requirements. The survey frequency will be determined utilizing MARSSIM statistical calculations and professional judgment. In addition, an alpha/beta scan survey of 10% of the applicable surface areas, including fixed equipment, is required.

Non-impacted. Are areas having no reasonable potential for residual contamination. There are no survey requirements associated with non-impacted areas.

To what radiological hazards could the worker be exposed?

For the interior of Building 123, reconnaissance level characterization surveys identified areas containing radioactive material above the unrestricted release criteria. The primary radiological hazard will be present during remedial action activities of Room 105 in Building 123. This work has the potential of exposing the worker to airborne radioactivity.

For the exterior of Buildings 123, 113 and 114 and the interiors of Buildings 113 and 114, a minimal radiological hazard exists because process knowledge and history suggests that if radioactive material is present it will be in quantities which are a small fraction of the applicable limits.

Step 5

What is the basis for the decision in Step 2?

The unrestricted release criteria outlined in Appendix A is the basis for deciding whether the structures and components of Buildings 123, 113 and 114 can be released in an unrestricted manner.

The survey frequency required to allow an unrestricted release is based on guidance from

NUREG/CR-5849 - *Manual for Conducting Radiological Surveys in Support of License Termination*

Draft MARSSIM - *Multi-Agency Radiation Survey and Site Investigation Manual*

Are there any regulatory and statistical drivers for sampling frequency?

The survey frequency required to allow an unrestricted release is based on guidance from

NUREG/CR-5849 - *Manual for Conducting Radiological Surveys in Support of License Termination*

Draft MARSSIM - *Multi-Agency Radiation Survey and Site Investigation Manual*

1-P73-HSP-18 10 - *Radioactive Material Transfer and Unrestricted Release of Property and Waste*

What are the required instrumentation sensitivities?

The MDA of the instruments used to perform the surveys required in this CRSP will be a fraction of the unrestricted release criteria outlined in Appendix A. A goal will be to have the MDA of an instrument at or below 50% of the unrestricted release criteria. Instrument scanning speeds will be slow enough (2"/sec alpha and 4"/sec beta) to ensure a small diameter (point) source detection frequency greater than 50% at the guideline levels, as recommended by ANSI N13.12, *Draft American National Standard Control of Radioactive Surface Contamination on Materials, Equipment, and Facilities to be Released for Uncontrolled Use*. Additionally, each instrument will have a greater than 90% probability of observing a second event within a static count time of 6 seconds.

What action levels are applicable to the decision or parameter of interest?

The unrestricted release criteria is outlined in Appendix A.

Define the decisions using "if...then" statements.

IF the structures and components of Buildings 123, 113 and 114 contain no radioactive material above the unrestricted release criteria, **THEN** those components may be released for unrestricted use.

IF the structures and components of Buildings 123, 113 and 114 contain radioactive material above the unrestricted release criteria, **THEN** those components will be decontaminated or removed.

IF decontaminated structures and components of Buildings 123, 113 and 114 contain radioactive material above the unrestricted release criteria, **THEN** those components will not be released for unrestricted use.

IF removed materials (structures and components) are radioactively contaminated, **THEN** those removed materials will not be released for unrestricted use.

Step 6

What sample size is necessary for the analysis being completed?

The sample size is defined for different survey units based on the classification of their associated subdivisions as summarized in the table below.

Survey Unit	Description	Class	# Fixed Survey Points per unit	# Removable Survey Points per unit	Scan (%)
11, 26, 29, 32, 35, 38, 41, 44	floor	1	Per Appendix C	Per Appendix C	100
1, 3, 5, 7, 9, 14, 16, 18, 20, 22, 24, 47	floor	2	Per Appendix C	Per Appendix C	75
12, 27, 30, 33, 36, 39, 42, 45	walls (< 2 m)	2	Per Appendix C	Per Appendix C	75
2, 4, 6, 8, 10, 15, 17, 19, 21, 23, 25, 48	walls / ceiling	3	Per Appendix C	Per Appendix C	75

Survey Unit	Description	Class	# Fixed Survey Points per unit	# Removable Survey Points per unit	Scan (%)
13, 28, 31, 34, 37, 40, 43, 46	walls (> 2 m) / ceiling	3	Per Appendix C	Per Appendix C	10
50	Rooms 156, 157 & 158 process waste sumps	1	Per Appendix C	Per Appendix C	100
49	pipe chase	3	Per Appendix C	Per Appendix C	10
52	B123 Ventilation	3	45	45	10
53	B123 Sanitary drains	3	45	45	10
51	B113 & 114 interior	3	Per Appendix C	Per Appendix C	10
54, 55, 56	B123,113 &114 exterior	3	Per Appendix C	Per Appendix C	10

What is the expected range of the parameter of interest?

All parameter values are expected to be less than the unrestricted release criteria outlined in Appendix A

Define both types of decision errors, (false negative and false positive)?

False negative (Type 1) errors would occur when a detector's response is below the unrestricted release criteria when, in fact, radioactive material is present above the unrestricted release criteria

False positive (Type 2) errors would occur when a detector's response is above the unrestricted release criteria when, in fact, radioactive material is not present above the unrestricted release criteria

What are the potential consequences of an incorrect decision?

For false negative errors, area/material would be released in an unrestricted manner when it should not be released in an unrestricted manner

For false positive errors, area/material would not be released in an unrestricted manner when it should be released in an unrestricted manner

What are the limits on decision errors?

The probability of making a Type I decision error, level α has been set at 0.05. The probability of making a Type II decision error, level β has been set at 0.05. A 95% confidence level will be applied for both Type I and Type II errors for Class 1, 2 and 3 survey units

Step 7

What method will be used to obtain the desired information?

The survey methods to be utilized are in conformance with specific sample analysis plans and the following RFETS procedures

4-K62-ROI-03 01	<i>Performance of Surface Contamination Surveys</i>
4-S23-ROI-03 02	<i>Radiological Requirements for Unrestricted Release</i>
4-Q97-REP-1003	<i>Radiological Evaluation for Unrestricted Release of Property/Waste</i>
1-P73-HSP-18 10	<i>Radioactive Maternal Transfer and Unrestricted Release of Property and Waste</i>

What level of worker protection is required to perform survey and other work in the facility, structure or environs?

Standard industrial safety practices are utilized. Worker personnel protection clothing is identified in the Activity Hazard Analysis (AHA) and Radiological Work Permit (RWP) if required. Safety glasses, safety shoes, and leather gloves are required by the task AHA. No removable radioactive contamination has been identified or is suspected on the surfaces being surveyed. Therefore, no radiological protection is required to perform additional characterization or final radiological surveys. Worker protection during remedial action activities, including remedial action support surveys will be based on the actual or anticipated radiological conditions. Protective clothing, containment and respiratory protection requirements will be annotated on the governing RWP.

How will the survey design be optimized?

Areas which have a common history or other characteristics, or are naturally distinguishable from other portions of the site have been partitioned into Survey Groups. Survey Groups are further subdivided based on contamination potential into Survey Units. Measurement locations will be clearly identified to provide a method of referencing survey results to survey measurement locations. Gridding will be used for the floors and walls for areas designated as Class 1 or 2 for final classification only. Grids may be marked by paint, a chalk line, or labels at grid locations. In areas where gridding is not practical or cost effective, measurement locations will be marked with labels or similar method or delineated on a map as directed by Radiological Engineering.

Have data quantity and quality assurance requirements for sampling been reviewed and incorporated into the survey process?

Quality assurance is addressed in Section 8.0 of this CRSP. The survey reports are prepared and reviewed in accordance with RFETS procedures.

7.0 RESPONSIBILITIES

7.1 PROJECT MANAGER

The Project Manager is responsible for reviewing and approving Building 123 Decommissioning Project CRSP and Report.

7.2 RADIOLOGICAL ENGINEERING

Radiological Engineering is responsible to

- Evaluate the project structures and appropriately classify the areas for survey
- Develop overall technical aspects, planning, and scheduling for implementation of the Close-Out Radiological Survey
- Define the content and ensure preparation of Building 123 Decommissioning Project Close-Out Radiological Survey Report (CRSR)
- Develop, review, and approve Property/Waste Release Evaluations (P/WRE)
- Resolve issues regarding survey layout and gridding requirements
- Review and approve Building 123 Decommissioning Project CRSP and Report
- Ensure that the Close-Out Radiological Survey is developed and consistent with RFETS requirements
- Test the null hypothesis and determine if additional surveys are required

7.3 RADIOLOGICAL CONTROL TECHNICAL SUPERVISOR

The Radiological Control Technical Supervisor is responsible to

- Ensure Radiological Control Technicians assigned to perform radiological surveys have been trained and qualified to the applicable Site procedures
- Review surveys and sample analysis results for completeness, accuracy, and legibility
Ensure discrepancies in survey data are identified and corrected

7.4 RADIOLOGICAL CONTROL TECHNICIANS

The Radiological Control Technicians are responsible to

- Perform surveys in accordance with this plan, approved RFETS procedures, and direction provided by the Radiological Engineer
- Provide complete, accurate, and legible documentation for all surveys performed

8.0 QUALITY ASSURANCE (QA)

8.1 SURVEY DOCUMENTATION

Records of the survey will be maintained in a survey package. The survey package will be the primary method of controlling and tracking close-out radiological survey results. The records compiled in a survey package will include (if applicable)

- Completed Contamination Survey Results (Fixed and Removable)
- Completed PREs
- Survey Area Diagrams/Maps

- Printout of Smear Survey Analysis
- Laboratory Analysis Results
- Data Analysis Summary
- Completed Chain of Custody Forms

8.2 CHAIN OF CUSTODY (COC)

Samples will be managed to ensure that there is an accurate record of sample collection, transport, analysis, and disposal. This will insure that samples are neither lost nor tampered with and that the sample analyzed is traceable to a specific location in the field. COC documentation shall be completed for all samples submitted for laboratory analysis. The COC form will be included as part of the close-out radiological survey documentation.

8.3 ANALYTICAL LABORATORY QA/QUALITY CONTROL (QC)

All samples collected for special analysis will be analyzed by RFETS laboratories or an approved contracted laboratory. The analysis will be performed by trained individuals using appropriate equipment and procedures. The laboratory will have analytical capabilities for the radionuclides of interest (Plutonium, Americium, Uranium, Thorium, Curium and Cesium) and an established QA/QC program which assures the validity of the analytical results. The laboratory analytical methods will be capable of measuring levels below the established release criteria. All results will state the detection limit for the analysis.

9.0 REPORTING SURVEY FINDINGS

A CRSP Report will be prepared at the conclusion of the project. The report will be prepared by the Decommissioning Radiological Engineer and the cognizant SSOC Radiological Engineer. All measurements will be reported in units appropriate for comparison with Appendix A surface contamination limits. Total and removable surface activity measurements will be reported in units of dpm per 100 cm². A summary of the following measurement results and overall conclusions showing that the building surfaces meet the release criteria will be provided.

- Total Surface Beta-Gamma Activity
- Total Surface Alpha Activity
- Removable Surface Beta-Gamma Activity
- Removable Surface Alpha Activity
- Gross Alpha and Beta Activity of Building Material Samples
- Isotopic Abundances of the Contaminants of Concern From Building Material Samples

The 95% confidence level will be used to further demonstrate attainment of the release limits once the individual measurements have demonstrated compliance with the release criteria. The confidence level will be calculated using normal statistics (one-tailed test) at the 95% confidence level. In addition, the upper confidence limit (UCL) about the mean (95% confidence level) will be reported for comparison to the release criteria.

10.0 REFERENCES

NUREG/CR-5849 - *Manual For Conducting Radiological Surveys In Support Of License Termination* (Draft)

MARSSIM - *Multi-Agency Radiation Survey And Site Investigation Manual* (Draft)

Site Procedure 4-K62-ROI-03 01, *Performance Of Surface Contamination Surveys*

Site Procedure 4-S23-ROI-03 02, *Radiological Requirements For Unrestricted Release*

Site Procedure 4-Q97-REP-1003, *Radiological Evaluation For Unrestricted Release Of Property/Waste*

Site Procedure I-P73-HSP-18 10, *Radioactive Material Transfer And Unrestricted Release Of Property And Waste*

Reconnaissance Level Characterization Report For The Building 123, RF/RMRS-97-021, August 1997

Decommissioning Program Plan, Draft, July 1997

DOE, 1996, *Final Rocky Flats Cleanup Agreement*, Rocky Flats Environmental Technology Site, Golden, CO

Radiological Engineering Site Operations Technical Basis Document, *Methods to Demonstrate Compliance with Performance Requirements for Swipe Counting and Portable Contamination Survey Instrumentation used to Evaluate Property and Waste for Unrestricted Release*, Rocky Flats Environmental Technology Site, June 7, 1995

Summary Report of In-Situ Gamma Spectroscopy in Building 123, Prepared for SEG, Colorado by GTS Duratek, September 26, 1997

No-Radioactivity -Added (NRA) Waste Verification Program, EG&G Rocky Flats Plant, September 1993

Appendix A
Surface Contamination Guidelines

Table A-1 Surface Contamination Guidelines

Allowable Total Residual Surface Contamination (dpm/100 cm ²) ¹			
Radionuclides ²	Average ^{3,4}	Maximum ^{4,5}	Removable ^{4,6}
Transuranics, I-125, I-129, Ra-226, Ra-228, Ac-227, Th-228, Th-230, Pa-231	100 ⁸	300 ⁸	20 ⁸
Th-Natural, Th-232, Sr-90, Ra-223, Ra-224, U-232, I-126, I-131, I-133	1,000	3,000	200
U-Natural, U-235, U-238, and associated decay products, alpha emitters.	5,000	15,000	1,000
Beta-gamma emitters, (radionuclides with decay modes other than alpha emission or spontaneous fission) except Sr-90 and others noted above ⁷	5,000	15,000	1,000

- ¹ As used in this table, dpm (disintegrations per minute) means the rate of emission by radioactive material as determined by correcting the counts per minute measured by an appropriate detector for background, efficiency, and geometric factors associated with the instrumentation
- ² Where surface contamination by both alpha and beta-gamma emitting radionuclides exist, the limits established for alpha and beta-gamma emitting radionuclides should apply independently
- ³ Measurements of average contamination should not be averaged over an area of more than 1 m². For objects of less surface area, the average should be derived for each object
- ⁴ The average and maximum dose rates associated with surface contamination resulting from beta-gamma emitters should not exceed 0.2 mrad/hour and 1.0 mrad/hour, respectively, at 1 cm
- ⁵ The maximum contamination level applies to an area of not more than 100 cm²
- ⁶ The amount of removable material per 100 cm² of surface area should be determined by wiping an area of that size with a dry filter of soft absorbent paper, applying moderate pressure, and measuring the amount of radioactive material on the wiping with an appropriate instrument of known efficiency. When removable contamination on objects of surface area less than 100 cm² is determined, the activity per unit area should be based on the actual area and the entire surface should be wiped. It is not necessary to use wiping techniques to measure removable contamination levels if direct scan surveys indicate the total residual surface contamination levels are within the limits for removable contamination
- ⁷ This category of radionuclides includes mixed fission products, including the Sr-90 which is present in them. It does not apply to Sr-90 which has been separated from the other fission products or mixtures where the Sr-90 has been enriched
- ⁸ DOE 5400.5 lists these values as "Reserved". These limits have been taken from the *Nuclear Regulatory Commission Regulatory Guide 1.86*, as directed by DOE/RFO Memorandum, May 11, 1993, RPB FJJ 05220, Phase III of *Moratorium on Release of Materials For Unrestricted Use*

Appendix B

MARSSIM Statistical Methodology for

Estimating the Number of Sample Points

This appendix provides guidance for estimating the number of sample points required. As is the case with the 123 Cluster, the contaminants of concern are not present in background (in significant levels), therefore, a one sample sign test is performed to estimate the number of data points.

The initial step in determining the number of data points in the one-sample case is to calculate the relative shift, $\Delta/\sigma_s = (DCGL-LBGR)/\sigma_s$ from the derived concentration guideline level (DCGL), the lower bound of the gray region (LBGR), and the sample standard deviation (σ_s). The σ_s may be obtained from earlier surveys, limited preliminary measurements, or a reasonable estimate. The smaller the value of the relative shift, the larger the number of data points are required to demonstrate compliance.

Two extremes have been evaluated. The first involves the lowest value for (DCGL-LBGR) which occurs when the removable alpha contamination DCGL is applied. The second involves the highest value for σ_s , which was obtained during the scoping surveys performed in Building 123. A DCGL of 750 dpm/100 cm² was used based on the 75% of the Thorium-232 release criteria (Reference Kaiser-Hill memo 97-RF-05729, Department of Energy (DOE) Order 5400.5, Figure IV-1- Surface Contamination Guidelines) and the application of these limits towards *Naturally Radioactive Decay Chains and the Ingrowth of Progeny from Purified Naturally Occurring Radioisotopes*, WAH-351-97. The resulting sample quantities are calculated below.

Number of Removable Transuranic Alpha Contamination Measurements Required

Assumptions

DCGL = 20 dpm/100 cm²

LBGR = 16 dpm/100 cm² (80% of DCGL based on professional judgement)

$\sigma_s = 3$ dpm/100 cm² based on the following assumptions

- Swipes counted using an Eberline SAC-4 with an MDA of 18 dpm/100 cm²
 - Building 123 had approximately 3800 removable measurements performed with all values below MDA
 - The distribution of survey results is assumed to be 9 ± 3 dpm/100 cm² which is the mean $\pm 1\sigma$, therefore the mean $\pm 3\sigma$ equals 18 dpm/100 cm²
- $\alpha = \beta = 0.05$ (for a 95% confidence level)

N values taken from MARSSIM, Table 5.5

$$(DCGL - LBGR) / \sigma = (20 - 16) / 3 = 1.33$$

The number of samples = 21

Number of Fixed Beta Contamination Measurements Required

Assumptions

Th-232 activity measured indirectly from Ac-228 Beta emission
DCGL = 750 dpm/100 cm², based on 75% of the Th-232 release criteria
LBGR = 600 dpm/100 cm² (80% of DCGL based on professional judgement)
 $\sigma_s = 199$ dpm/100 cm² based on survey data obtained during scoping of Building 123 hallways (402 survey points, mean and σ_s equal to 548 17 and 198 97 dpm/100 cm², respectively)
 $\alpha = \beta = 0.05$ (for a 95% confidence level)

N values extrapolated from MARSSIM, Table 5.5

$$(\text{DCGL} - \text{LBGR}) / \sigma = (750 - 600) / 199 = 0.75$$

$$\text{The number of samples} = 50 - (0.8 - 0.75) \times (50 - 40) / 0.1 = 45$$

The estimated sample quantity is most limiting for fixed beta contamination and will be the minimum number of fixed and removable alpha and beta contamination survey points obtained in each survey unit, unless otherwise specified in specific survey instructions. This quantity will be verified during statistical tests of the final survey data and will be reported in the Final Survey Close-Out Report for the Building 123 Cluster.

Appendix C
Radiological Survey Instructions

Activity Hazard Analysis-Radiological Surveys for the 123 Cluster

Principle Steps	Potential Hazards	Control Measure
1 Performance checking instruments	<ul style="list-style-type: none"> a Handling radioactive check sources, b Work with electrical equipment 	<ul style="list-style-type: none"> a Radioactive check sources leak checked semi-annually b Electrical safety checks performed during instrument calibration
2 Performing contamination surveys	<ul style="list-style-type: none"> a Construction hazards, b Confined space entry, c Work in overhead and on roof tops, d Back strains, slips, trips and falls, e Work in potentially contaminated areas, f Sharp objects 	<ul style="list-style-type: none"> a PPE steel-toed shoes, hard hats and safety glasses Workers briefed on construction activities b Controlled IAW 1-E36-HSP-6 04, <i>Confined Space Entry</i> c Use of ladders, scaffolds and fall protection controlled IAW 1-K59-HSP-22 02, <i>Ladders</i>, 1-B54-HSP-22 03, <i>Scaffolds</i> and HSP 22 05, <i>Fall Protection and Equipment</i> d Workers trained on proper bending and lifting Workers aware of surroundings e Follow governing RWP f Leather gloves
3 Analyzing swipes	<ul style="list-style-type: none"> a Work with electrical equipment, b Pinching hazard, 	<ul style="list-style-type: none"> a Electrical safety checks performed during instrument calibration

GROUP 1

Group 1 consists of Rooms 137 and 138. These rooms are located in the northeast corner of the courtyard adjacent to the east dock. Nitrous oxide was stored in Rms 137 and 138 were used as offices. Access into these rooms is from the outside only. Scoping and characterization surveys of Group 1 failed to identify radioactive contamination in excess of the release criteria. However, since radioactive contamination was discovered within the facility, the potential exists to spread contamination (by tracking) across the floor surfaces. Thus the floors specified in Group 1 have been designated as Class 2. The walls and ceiling are not expected to contain residual radioactivity and have been designated as Class 3. Classifications, grid criteria and survey densities are summarized below.

Radiological Surveys ⁽²⁾						
Survey Unit	Area ⁽¹⁾	Class	Grid	# Removable alpha / beta survey measurements	# Direct alpha / beta survey measurements	Scan Survey ⁽³⁾
1	Floors	2	3' x 3'	Minimum of 1/grid Minimum of 7/room	Minimum of 1/grid Minimum of 7/room	75%
2	Wall (< 2 m)	3	No	Minimum of 3/plane	Minimum of 3/plane	10%
	Wall (> 2 m) Ceiling	3	No	Minimum of 1/plane	Minimum of 1/plane	10%

Notes

- (1) See attached map for building layout
- (2) Surveys are to be performed in accordance with 4-K62-ROI-03 01, *Performance of Surface Contamination Surveys*, with the exception that actual observed values will be recorded when measurements are below the instrument MDA. Removable and Direct alpha/beta surveys will be performed prior to the required scan survey.
- (3) Perform an alpha scan (2 in/sec) and beta scan (4 in/sec) survey over the percentage of the accessible surfaces as listed, including fixed equipment/systems, paying particular attention to horizontal surfaces. Scan surveys are performed in areas having the highest potential for residual radioactivity. Document scan surveys by performing direct and removable alpha/beta measurements at locations where the net count rate corresponds to a level which equals the Derived Concentration Guideline Level (DCGL) (16 cpm alpha and 245 cpm beta for the NE Electra with DP6BD Probe). If previously obtained fixed and removable contamination surveys adequately document the scan, no further measurements are necessary. If no readings in excess of the DCGL were obtained during the scan, document this fact on the survey map cover sheet, further documentation is not required. Record direct and removable alpha/beta measurements obtained during the scan survey in accordance with Note (2) above.

GROUP 2

Group 2 consists of Rooms 140A, 141, 142, 143, 143A, 144, 146, 147, 150, and 151 in Building 123. This group consists of administrative offices used primarily by the Radiological Health Department Staff. Scoping and characterization surveys of Group 2 failed to identify radioactive contamination in excess of the release criteria. However, since radioactive contamination was discovered within the facility, the potential exists to spread contamination (by tracking) across the floor surfaces. Thus the floors specified in Group 2 have been designated as Class 2. The walls and ceiling are not expected to contain residual radioactivity and have been designated as Class 3. Classifications, grid criteria and survey densities are summarized below:

Radiological Surveys(2) (4)						
Survey Unit	Area(1)	Class	Grid	# Removable alpha / beta survey measurements	# Direct alpha / beta survey measurements	Scan Survey(3)
3	Floors	2	3' x 3'	Minimum of 1/grid	Minimum of 1/grnd	75%
4	Wall (< 2 m)	3	No	Minimum of 3/plane	Minimum of 3/plane	10%
	Wall (> 2 m) Ceiling	3	No	Minimum of 1/plane	Minimum of 1/plane	10%

Notes

- (1) See attached map for building layout
- (2) Surveys are to be performed in accordance with 4-K62-ROI-03 01, *Performance of Surface Contamination Surveys*, with the exception that actual observed values will be recorded when measurements are below the instrument MDA. Surveys are to be performed on accessible surfaces including fixed equipment/systems paying particular attention to horizontal surfaces. Removable and Direct alpha/beta surveys will be performed prior to the required scan survey.
- (3) Perform an alpha scan (2 in/sec) and beta scan (4 in/sec) survey over the percentage of the accessible surfaces as listed, including fixed equipment/systems, paying particular attention to horizontal surfaces. Scan surveys are performed in areas having the highest potential for residual radioactivity. Document scan surveys by performing direct and removable alpha/beta measurements at locations where the net count rate corresponds to a level which equals the Derived Concentration Guideline Level (DCGL) (16 cpm alpha and 245 cpm beta for the NE Electra with DP6BD Probe). If previously obtained fixed and removable contamination surveys adequately document the scan, no further measurements are necessary. If no readings in excess of the DCGL were obtained during the scan, document this fact on the survey map cover sheet, further documentation is not required. Record direct and removable alpha/beta measurements obtained during the scan survey in accordance with Note (2) above.
- (4) A minimum of 45 fixed and removable data points will be obtained for each Survey Unit.

GROUP 3

Group 3 consists of Rooms 149 and 165 in Building 123. Room 165 was used as a computer room. Room 149 was used as a gamma spectroscopy lab. A radioactive material storage area was established in the southwest corner of the room to store samples awaiting analysis. Sealed radioactive sources were stored in a locked cabinet in a lead shield. Scoping and characterization surveys of Group 3 failed to identify radioactive contamination in excess of the release criteria. However, since radioactive contamination was discovered within the facility, the potential exists to spread contamination (by tracking) across the floor surfaces. Thus the floors specified in Group 3 have been designated as Class 2. The walls and ceiling are not expected to contain residual radioactivity and have been designated as Class 3. Classifications, grid criteria and survey densities are summarized below.

Radiological Surveys ⁽²⁾ (4)						
Survey Unit	Area ⁽¹⁾	Class	Grid	# Removable alpha / beta survey measurements	# Direct alpha / beta survey measurements	Scan Survey ⁽³⁾
5	Floors	2	3' x 3'	Minimum of 1/grid	Minimum of 1/grid	75%
6	Wall (< 2 m)	3	No	Minimum of 3/plane	Minimum of 3/plane	10%
	Wall (> 2 m) Ceiling	3	No	Minimum of 1/plane	Minimum of 1/plane	10%

Notes

- (1) See attached map for building layout
- (2) Surveys are to be performed in accordance with 4-K62-ROI-03 01, *Performance of Surface Contamination Surveys*, with the exception that actual observed values will be recorded when measurements are below the instrument MDA. Surveys are to be performed on accessible surfaces including fixed equipment/systems paying particular attention to horizontal surfaces. Removable and Direct alpha/beta surveys will be performed prior to the required scan survey.
- (3) Perform an alpha scan (2 in/sec) and beta scan (4 in/sec) survey over the percentage of the accessible surfaces as listed, including fixed equipment/systems, paying particular attention to horizontal surfaces. Scan surveys are performed in areas having the highest potential for residual radioactivity. Document scan surveys by performing direct and removable alpha/beta measurements at locations where the net count rate corresponds to a level which equals the Derived Concentration Guideline Level (DCGL) (16 cpm alpha and 245 cpm beta for the NE Electra with DP6BD Probe). If previously obtained fixed and removable contamination surveys adequately document the scan, no further measurements are necessary. If no readings in excess of the DCGL were obtained during the scan, document this fact on the survey map cover sheet, further documentation is not required. Record direct and removable alpha/beta measurements obtained during the scan survey in accordance with Note (2) above.
- (4) A minimum of 45 fixed and removable data points will be obtained for each Survey Unit.

GROUP 4

Group 4 consists of Rooms 131, 131B, 131C, 132, 133, 133A, 133B, and 133C in Building 123. This group consists of administrative offices and work shop (Room 131, B and C) used primarily by the Health Physics Instrumentation Department for radiological instrumentation calibration and repair. Room 132 is an adjacent Utility Room. Scoping and characterization surveys of Group 4 failed to identify radioactive contamination in excess of the release criteria. However, since radioactive contamination was discovered within the facility, the potential exists to spread contamination (by tracking) across the floor surfaces. Thus the floors specified in Group 4 have been designated as Class 2. The walls and ceiling are not expected to contain residual radioactivity and have been designated as Class 3. Classifications, grid criteria and survey densities are summarized below.

Radiological Surveys ⁽²⁾ (4)						
Survey Unit	Area ⁽¹⁾	Class	Grid	# Removable alpha / beta survey measurements	# Direct alpha / beta survey measurements	Scan Survey ⁽³⁾
7	Floors	2	3' x 3'	Minimum of 1/gnd	Minimum of 1/gnd	75%
8	Wall (< 2 m)	3	No	Minimum of 3/plane	Minimum of 3/plane	10%
	Wall (> 2 m) Ceiling	3	No	Minimum of 1/plane	Minimum of 1/plane	10%

Notes

- (1) See attached map for building layout
- (2) Surveys are to be performed in accordance with 4-K62-ROI-03 01, *Performance of Surface Contamination Surveys*, with the exception that actual observed values will be recorded when measurements are below the instrument MDA. Surveys are to be performed on accessible surfaces including fixed equipment/systems paying particular attention to horizontal surfaces. Removable and Direct alpha/beta surveys will be performed prior to the required scan survey.
- (3) Perform an alpha scan (2 in/sec) and beta scan (4 in/sec) survey over the percentage of the accessible surfaces as listed, including fixed equipment/systems, paying particular attention to horizontal surfaces. Scan surveys are performed in areas having the highest potential for residual radioactivity. Document scan surveys by performing direct and removable alpha/beta measurements at locations where the net count rate corresponds to a level which equals the Derived Concentration Guideline Level (DCGL) (16 cpm alpha and 245 cpm beta for the NE Electra with DP6BD Probe). If previously obtained fixed and removable contamination surveys adequately document the scan, no further measurements are necessary. If no readings in excess of the DCGL were obtained during the scan, document this fact on the survey map cover sheet, further documentation is not required. Record direct and removable alpha/beta measurements obtained during the scan survey in accordance with Note (2) above.
- (4) A minimum of 45 fixed and removable data points will be obtained for each Survey Unit.

GROUP 5

Group 5 consists of Rooms 128, 128A, and 135 in Building 123. This group consists of administrative offices (Rooms 128 and 128A) used primarily by the Analytical Laboratory Department. Room 135 was used for alpha spectroscopy and liquid scintillation counting. Room 135 was established as a radioactive material storage area to accommodate the storage of sealed instrumentation check sources. Scoping and characterization surveys of Group 5 failed to identify radioactive contamination in excess of the release criteria. However, since radioactive contamination was discovered within the facility, the potential exists to spread contamination (by tracking) across the floor surfaces. Thus the floors specified in Group 5 have been designated as Class 2. The walls and ceiling are not expected to contain residual radioactivity and have been designated as Class 3. Classifications, grid criteria and survey densities are summarized below.

Radiological Surveys(2) (4)						
Survey Unit	Area(1)	Class	Grid	# Removable alpha / beta survey measurements	# Direct alpha / beta survey measurements	Scan Survey(3)
9	Floors	2	3' x 3'	Minimum of 1/grd	Minimum of 1/grd	75%
10	Wall (< 2 m)	3	No	Minimum of 3/plane	Minimum of 3/plane	10%
	Wall (> 2 m) Ceiling	3	No	Minimum of 1/plane	Minimum of 1/plane	10%

Notes

- (1) See attached map for building layout
- (2) Surveys are to be performed in accordance with 4-K62-ROI-03 01, *Performance of Surface Contamination Surveys*, with the exception that actual observed values will be recorded when measurements are below the instrument MDA. Surveys are to be performed on accessible surfaces including fixed equipment/systems paying particular attention to horizontal surfaces. Removable and Direct alpha/beta surveys will be performed prior to the required scan survey.
- (3) Perform an alpha scan (2 in/sec) and beta scan (4 in/sec) survey over the percentage of the accessible surfaces as listed, including fixed equipment/systems, paying particular attention to horizontal surfaces. Scan surveys are performed in areas having the highest potential for residual radioactivity. Document scan surveys by performing direct and removable alpha/beta measurements at locations where the net count rate corresponds to a level which equals the Derived Concentration Guideline Level (DCGL) (16 cpm alpha and 245 cpm beta for the NE Electra with DP6BD Probe). If previously obtained fixed and removable contamination surveys adequately document the scan, no further measurements are necessary. If no readings in excess of the DCGL were obtained during the scan, document this fact on the survey map cover sheet, further documentation is not required. Record direct and removable alpha/beta measurements obtained during the scan survey in accordance with Note (2) above.
- (4) A minimum of 45 fixed and removable data points will be obtained for each Survey Unit.

GROUP 6

Group 6 consists of Room 123A in Building 123. Room 123A is a hallway leading to the east dock. As a result of fixed contamination in excess of the release criteria identified on the carpeted floor during scoping surveys, this Survey Group has been subdivided into three Survey Units. The following classifications, grid criteria and survey densities apply.

Radiological Surveys ⁽²⁾ (4)						
Survey Unit	Area ⁽¹⁾	Class	Grid	# Removable alpha / beta survey measurements	# Direct alpha / beta survey measurements	Scan Survey ⁽³⁾
11	Floors	1	3' x 3'	Minimum of 1/grd	Minimum of 1/grd	100%
12	Wall (< 2 m)	2	3' x 3'	Minimum of 1/grd	Minimum of 1/grd	75%
13	Wall (> 2 m) Ceiling	3	No	Minimum of 1/plane	Minimum of 1/plane	10%

Notes

- (1) See attached map for building layout
- (2) Surveys are to be performed in accordance with 4-K62-ROI-03 01, *Performance of Surface Contamination Surveys*, with the exception that actual observed values will be recorded when measurements are below the instrument MDA. Surveys are to be performed on accessible surfaces including fixed equipment/systems paying particular attention to horizontal surfaces. Removable and Direct alpha/beta surveys will be performed prior to the required scan survey.
- (3) Perform an alpha scan (2 in/sec) and beta scan (4 in/sec) survey over the percentage of the accessible surfaces as listed, including fixed equipment/systems, paying particular attention to horizontal surfaces. Scan surveys are performed in areas having the highest potential for residual radioactivity. Document scan surveys by performing direct and removable alpha/beta measurements at locations where the net count rate corresponds to a level which equals the Derived Concentration Guideline Level (DCGL) (16 cpm alpha and 245 cpm beta for the NE Electra with DP6BD Probe). If previously obtained fixed and removable contamination surveys adequately document the scan, no further measurements are necessary. If no readings in excess of the DCGL were obtained during the scan, document this fact on the survey map cover sheet, further documentation is not required. Record direct and removable alpha/beta measurements obtained during the scan survey in accordance with Note (2) above.
- (4) A minimum of 45 fixed and removable data points will be obtained for each Survey Unit.

GROUP 7

Group 7 consists of Rooms 107, 107A, 107B, 122, and 123 in Building 123. Rooms 107, 107A, and 107B consists of administrative offices used primarily by the Radiological Health Department Staff. Room 123 was previously used by the Health Physics Instrumentation Department as a work shop for the calibration and repair of radiological instrumentation, it was later converted into an office. Room 122 has been used as a conference room. Scoping and characterization surveys of Group 7 failed to identify radioactive contamination in excess of the release criteria. However, since radioactive contamination was discovered within the facility, the potential exists to spread contamination (by tracking) across the floor surfaces. Thus the floors specified in Group 7 have been designated as Class 2. The walls and ceiling are not expected to contain residual radioactivity and have been designated as Class 3. Classifications, grid criteria and survey densities are summarized below.

Radiological Surveys ⁽²⁾ (4)						
Survey Unit	Area ⁽¹⁾	Class	Grid	# Removable alpha / beta survey measurements	# Direct alpha / beta survey measurements	Scan Survey ⁽³⁾
14	Floors	2	3' x 3'	Minimum of 1/grid	Minimum of 1/grid	75%
15	Wall (< 2 m)	3	No	Minimum of 3/plane	Minimum of 3/plane	10%
	Wall (> 2 m) Ceiling	3	No	Minimum of 1/plane	Minimum of 1/plane	10%

Notes

- (1) See attached map for building layout
- (2) Surveys are to be performed in accordance with 4-K62-ROI-03 01, *Performance of Surface Contamination Surveys*, with the exception that actual observed values will be recorded when measurements are below the instrument MDA. Surveys are to be performed on accessible surfaces including fixed equipment/systems paying particular attention to horizontal surfaces. Removable and Direct alpha/beta surveys will be performed prior to the required scan survey.
- (3) Perform an alpha scan (2 in/sec) and beta scan (4 in/sec) survey over the percentage of the accessible surfaces as listed, including fixed equipment/systems, paying particular attention to horizontal surfaces. Scan surveys are performed in areas having the highest potential for residual radioactivity. Document scan surveys by performing direct and removable alpha/beta measurements at locations where the net count rate corresponds to a level which equals the Derived Concentration Guideline Level (DCGL) (16 cpm alpha and 245 cpm beta for the NE Electra with DP6BD Probe). If previously obtained fixed and removable contamination surveys adequately document the scan, no further measurements are necessary. If no readings in excess of the DCGL were obtained during the scan, document this fact on the survey map cover sheet, further documentation is not required. Record direct and removable alpha/beta measurements obtained during the scan survey in accordance with Note (2) above.
- (4) A minimum of 45 fixed and removable data points will be obtained for each Survey Unit.

GROUP 8

Group 8 consists of Room 101, 101A, 102, and 102A in Building 123. This unit consists of administrative offices used primarily by the Radiological Health and Analytical Laboratory Department Staff. Scoping and characterization surveys of Group 8 failed to identify radioactive contamination in excess of the release criteria. However, since radioactive contamination was discovered within the facility, the potential exists to spread contamination (by tracking) across the floor surfaces. Thus the floors specified in Group 8 have been designated as Class 2. The walls and ceiling are not expected to contain residual radioactivity and have been designated as Class 3. Classifications, grid criteria and survey densities are summarized below.

Radiological Surveys ⁽²⁾ (4)						
Survey Unit	Area ⁽¹⁾	Class	Grid	# Removable alpha / beta survey measurements	# Direct alpha / beta survey measurements	Scan Survey ⁽³⁾
16	Floors	2	3' x 3'	Minimum of 1/gnd	Minimum of 1/gnd	75%
17	Wall (< 2 m)	3	No	Minimum of 3/plane	Minimum of 3/plane	10%
	Wall (> 2 m) Ceiling	3	No	Minimum of 1/plane	Minimum of 1/plane	10%

Notes

- (1) See attached map for building layout
- (2) Surveys are to be performed in accordance with 4-K62-ROI-03 01, *Performance of Surface Contamination Surveys*, with the exception that actual observed values will be recorded when measurements are below the instrument MDA. Surveys are to be performed on accessible surfaces including fixed equipment/systems paying particular attention to horizontal surfaces. Removable and Direct alpha/beta surveys will be performed prior to the required scan survey.
- (3) Perform an alpha scan (2 in/sec) and beta scan (4 in/sec) survey over the percentage of the accessible surfaces as listed, including fixed equipment/systems, paying particular attention to horizontal surfaces. Scan surveys are performed in areas having the highest potential for residual radioactivity. Document scan surveys by performing direct and removable alpha/beta measurements at locations where the net count rate corresponds to a level which equals the Derived Concentration Guideline Level (DCGL) (16 cpm alpha and 245 cpm beta for the NE Electra with DP6BD Probe). If previously obtained fixed and removable contamination surveys adequately document the scan, no further measurements are necessary. If no readings in excess of the DCGL were obtained during the scan, document this fact on the survey map cover sheet, further documentation is not required. Record direct and removable alpha/beta measurements obtained during the scan survey in accordance with Note (2) above.
- (4) A minimum of 45 fixed and removable data points will be obtained for each Survey Unit.

GROUP 9

Group 9 consists of Rooms 113, 113A, 113B, 115, 119, 119A, 119B in Building 123. Rooms 113, 113A, and 113B consists of men's locker room, rest room, and janitor's closet. Room 115 is a janitor's closet located off the north hallway in between the men's and women's locker rooms. Rooms 119, 119A, and 119B consists of women's locker room, women's rest room and janitor's closet. Scoping and characterization surveys of Group 9 failed to identify radioactive contamination in excess of the release criteria. However, since radioactive contamination was discovered within the facility, the potential exists to spread contamination (by tracking) across the floor surfaces. Thus the floors specified in Group 9 have been designated as Class 2. The walls and ceiling are not expected to contain residual radioactivity and have been designated as Class 3. Classifications, grid criteria and survey densities are summarized below:

Radiological Surveys(2) (4)						
Survey Unit	Area ⁽¹⁾	Class	Grid	# Removable alpha / beta survey measurements	# Direct alpha / beta survey measurements	Scan Survey ⁽³⁾
18	Floors	2	3' x 3'	Minimum of 1/grid	Minimum of 1/grid	75%
19	Wall (< 2 m)	3	No	Minimum of 3/plane	Minimum of 3/plane	10%
	Wall (> 2 m) Ceiling	3	No	Minimum of 1/plane	Minimum of 1/plane	10%

Notes

- (1) See attached map for building layout
- (2) Surveys are to be performed in accordance with 4-K62-ROI-03 01, *Performance of Surface Contamination Surveys*, with the exception that actual observed values will be recorded when measurements are below the instrument MDA. Surveys are to be performed on accessible surfaces including fixed equipment/systems paying particular attention to horizontal surfaces. Removable and Direct alpha/beta surveys will be performed prior to the required scan survey.
- (3) Perform an alpha scan (2 in/sec) and beta scan (4 in/sec) survey over the percentage of the accessible surfaces as listed, including fixed equipment/systems, paying particular attention to horizontal surfaces. Scan surveys are performed in areas having the highest potential for residual radioactivity. Document scan surveys by performing direct and removable alpha/beta measurements at locations where the net count rate corresponds to a level which equals the Derived Concentration Guideline Level (DCGL) (16 cpm alpha and 245 cpm beta for the NE Electra with DP6BD Probe). If previously obtained fixed and removable contamination surveys adequately document the scan, no further measurements are necessary. If no readings in excess of the DCGL were obtained during the scan, document this fact on the survey map cover sheet, further documentation is not required. Record direct and removable alpha/beta measurements obtained during the scan survey in accordance with Note (2) above.
- (4) A minimum of 45 fixed and removable data points will be obtained for each Survey Unit.

GROUP 10

Group 10 consists of Rooms 155, 155A, and a vault in Building 123. Room 155 has been used as an administrative office and contains a lung counter vault. Room 155A housed the TLD Irradiator used by external dosimetry. The irradiator contained a sealed 2 Curie Cs-137 source. Scoping and characterization surveys of Group 10 failed to identify radioactive contamination in excess of the release criteria. However, since radioactive contamination was discovered within the facility, the potential exists to spread contamination (by tracking) across the floor surfaces. Thus the floors specified in Group 10 have been designated as Class 2. The walls and ceiling are not expected to contain residual radioactivity and have been designated as Class 3. Classifications, grid criteria and survey densities are summarized below.

Radiological Surveys ⁽²⁾ (4)						
Survey Unit	Area ⁽¹⁾	Class	Grid	# Removable alpha / beta survey measurements	# Direct alpha / beta survey measurements	Scan Survey ⁽³⁾
20	Floors	2	3' x 3'	Minimum of 1/grid	Minimum of 1/grid	75%
21	Wall (< 2 m)	3	No	Minimum of 3/plane	Minimum of 3/plane	10%
	Wall (> 2 m) Ceiling	3	No	Minimum of 1/plane	Minimum of 1/plane	10%

Notes

- (1) See attached map for building layout
- (2) Surveys are to be performed in accordance with 4-K62-ROI-03 01, *Performance of Surface Contamination Surveys*, with the exception that actual observed values will be recorded when measurements are below the instrument MDA. Surveys are to be performed on accessible surfaces including fixed equipment/systems paying particular attention to horizontal surfaces. Removable and Direct alpha/beta surveys will be performed prior to the required scan survey.
- (3) Perform an alpha scan (2 in/sec) and beta scan (4 in/sec) survey over the percentage of the accessible surfaces as listed, including fixed equipment/systems, paying particular attention to horizontal surfaces. Scan surveys are performed in areas having the highest potential for residual radioactivity. Document scan surveys by performing direct and removable alpha/beta measurements at locations where the net count rate corresponds to a level which equals the Derived Concentration Guideline Level (DCGL) (16 cpm alpha and 245 cpm beta for the NE Electra with DP6BD Probe). If previously obtained fixed and removable contamination surveys adequately document the scan, no further measurements are necessary. If no readings in excess of the DCGL were obtained during the scan, document this fact on the survey map cover sheet, further documentation is not required. Record direct and removable alpha/beta measurements obtained during the scan survey in accordance with Note (2) above.
- (4) A minimum of 45 fixed and removable data points will be obtained for each Survey Unit.

GROUP 11

Group 11 consists of Rooms 159, 160, and 161 in Building 123. This unit consists of administrative offices (Rooms 160 and 161) used primarily by the Analytical Laboratory Group. Room 159 is an adjacent Utility Room. Scoping and characterization surveys of Group 11 failed to identify radioactive contamination in excess of the release criteria. However, since radioactive contamination was discovered within the facility, the potential exists to spread contamination (by tracking) across the floor surfaces. Thus the floors specified in Group 11 have been designated as Class 2. The walls and ceiling are not expected to contain residual radioactivity and have been designated as Class 3. Classifications, grid criteria and survey densities are summarized below.

Radiological Surveys ⁽²⁾ (4)						
Survey Unit	Area ⁽¹⁾	Class	Grid	# Removable alpha / beta survey measurements	# Direct alpha / beta survey measurements	Scan Survey ⁽³⁾
22	Floors	2	3' x 3'	Minimum of 1/gnd	Minimum of 1/gnd	75%
23	Wall (< 2 m)	3	No	Minimum of 3/plane	Minimum of 3/plane	10%
	Wall (> 2 m) Ceiling	3	No	Minimum of 1/plane	Minimum of 1/plane	10%

Notes

- (1) See attached map for building layout
- (2) Surveys are to be performed in accordance with 4-K62-ROI-03 01, *Performance of Surface Contamination Surveys*, with the exception that actual observed values will be recorded when measurements are below the instrument MDA. Surveys are to be performed on accessible surfaces including fixed equipment/systems paying particular attention to horizontal surfaces. Removable and Direct alpha/beta surveys will be performed prior to the required scan survey.
- (3) Perform an alpha scan (2 in/sec) and beta scan (4 in/sec) survey over the percentage of the accessible surfaces as listed, including fixed equipment/systems, paying particular attention to horizontal surfaces. Scan surveys are performed in areas having the highest potential for residual radioactivity. Document scan surveys by performing direct and removable alpha/beta measurements at locations where the net count rate corresponds to a level which equals the Derived Concentration Guideline Level (DCGL) (16 cpm alpha and 245 cpm beta for the NE Electra with DP6BD Probe). If previously obtained fixed and removable contamination surveys adequately document the scan, no further measurements are necessary. If no readings in excess of the DCGL were obtained during the scan, document this fact on the survey map cover sheet, further documentation is not required. Record direct and removable alpha/beta measurements obtained during the scan survey in accordance with Note (2) above.
- (4) A minimum of 45 fixed and removable data points will be obtained for each Survey Unit.

GROUP 12

Group 12 consists of Rooms 162, 162A, 162B, 163 in Building 123. This group consists of administrative offices used primarily by the Radiological Health Department. During the deactivation of Building 123 these rooms are being used by Radiological Control Technicians for analysis of swipe surveys. Room 163 served as the Site's Air Filter Counting Facility. Air filters were screened prior to being sent to Room 163 for analysis to ensure filters in excess of 2500 dpm are not sent to Room 163. Scoping and characterization surveys of Group 12 failed to identify radioactive contamination in excess of the release criteria. However, since radioactive contamination was discovered within the facility, the potential exists to spread contamination (by tracking) across the floor surfaces. Thus the floors specified in Group 12 have been designated as Class 2. The walls and ceiling are not expected to contain residual radioactivity and have been designated as Class 3. Classifications, grid criteria and survey densities are summarized below.

Radiological Surveys ⁽²⁾ ⁽⁴⁾						
Survey Unit	Area ⁽¹⁾	Class	Grid	# Removable alpha / beta survey measurements	# Direct alpha / beta survey measurements	Scan Survey ⁽³⁾
24	Floors	2	3' x 3'	Minimum of 1/grid	Minimum of 1/grid	75%
25	Wall (< 2 m)	3	No	Minimum of 3/plane	Minimum of 3/plane	10%
	Wall (> 2 m) Ceiling	3	No	Minimum of 1/plane	Minimum of 1/plane	10%

Notes

- (1) See attached map for building layout
- (2) Surveys are to be performed in accordance with 4-K62-ROI-03 01, *Performance of Surface Contamination Surveys*, with the exception that actual observed values will be recorded when measurements are below the instrument MDA. Surveys are to be performed on accessible surfaces including fixed equipment/systems paying particular attention to horizontal surfaces. Removable and Direct alpha/beta surveys will be performed prior to the required scan survey.
- (3) Perform an alpha scan (2 in/sec) and beta scan (4 in/sec) survey over the percentage of the accessible surfaces as listed, including fixed equipment/systems, paying particular attention to horizontal surfaces. Scan surveys are performed in areas having the highest potential for residual radioactivity. Document scan surveys by performing direct and removable alpha/beta measurements at locations where the net count rate corresponds to a level which equals the Derived Concentration Guideline Level (DCGL) (16 cpm alpha and 245 cpm beta for the NE Electra with DP6BD Probe). If previously obtained fixed and removable contamination surveys adequately document the scan, no further measurements are necessary. If no readings in excess of the DCGL were obtained during the scan, document this fact on the survey map cover sheet, further documentation is not required. Record direct and removable alpha/beta measurements obtained during the scan survey in accordance with Note (2) above.
- (4) A minimum of 45 fixed and removable data points will be obtained for each Survey Unit.

GROUP 13

Group 13 consists of Rooms 103 and 103A in Building 123. Room 103 was used as a reagent preparation laboratory and contains a process waste system sink. Room 103A was used as a special bioassay laboratory, samples were prepared for analysis. Because the potential for and extent of residual radioactivity varies throughout this area, Group 13 has been subdivided into three survey units. The floors have been designated as Class 1 since they are expected to have the greatest potential for residual radioactivity in excess of the DCGLw. The walls below 2 meters have been designated as Class 2 based on the operating history, and the potential for residual radioactivity to exist below the DCGLw. The walls above 2 meters and the ceiling are not expected to contain residual radioactivity and have been designated Class 3. Classifications, grid criteria and survey densities are summarized below:

Radiological Surveys(2) (4)						
Survey Unit	Area(1)	Class	Grid	# Removable alpha / beta survey measurements	# Direct alpha / beta survey measurements	Scan Survey(3)
26	Floors	1	3' x 3'	Minimum of 1/grid	Minimum of 1/grid	100%
27	Wall (< 2 m)	2	3' x 3'	Minimum of 1/grid	Minimum of 1/grid	75%
28	Wall (> 2 m) Ceiling	3	No	Minimum of 3/plane	Minimum of 3/plane	10%

Notes

- (1) See attached map for building layout
- (2) Surveys are to be performed in accordance with 4-K62-ROI-03 01, *Performance of Surface Contamination Surveys*, with the exception that actual observed values will be recorded when measurements are below the instrument MDA. Surveys are to be performed on accessible surfaces including fixed equipment/systems paying particular attention to horizontal surfaces. Removable and Direct alpha/beta surveys will be performed prior to the required scan survey.
- (3) Perform an alpha scan (2 in/sec) and beta scan (4 in/sec) survey over the percentage of the accessible surfaces as listed, including fixed equipment/systems, paying particular attention to horizontal surfaces. Scan surveys are performed in areas having the highest potential for residual radioactivity. Document scan surveys by performing direct and removable alpha/beta measurements at locations where the net count rate corresponds to a level which equals the Derived Concentration Guideline Level (DCGL) (16 cpm alpha and 245 cpm beta for the NE Electra with DP6BD Probe). If previously obtained fixed and removable contamination surveys adequately document the scan, no further measurements are necessary. If no readings in excess of the DCGL were obtained during the scan, document this fact on the survey map cover sheet, further documentation is not required. Record direct and removable alpha/beta measurements obtained during the scan survey in accordance with Note (2) above.
- (4) A minimum of 45 fixed and removable data points will be obtained for each Survey Unit.

GROUP 14

Group 14 consists of Rooms 105 and 106. Room 105 was used as a research and development laboratory, as well as the spike solution preparation laboratory. Scoping surveys identified Room 105 as the most contaminated area in Building 123. Room 106 was used as an office adjacent to Room 105. Radioactive contamination in excess of the release criteria was identified during scoping surveys, most probably originating from Room 105. The following classifications, grid criteria and survey densities apply.

Radiological Surveys ⁽²⁾ (4)						
Survey Unit	Area ⁽¹⁾	Class	Grid	# Removable alpha / beta survey measurements	# Direct alpha / beta survey measurements	Scan Survey ⁽³⁾
29	Floors	1	3' x 3'	Minimum of 1/grd	Minimum of 1/grd	100%
30	Wall (< 2 m)	2	3' x 3'	Minimum of 1/grd	Minimum of 1/grd	75%
31	Wall (> 2 m) Ceiling	3	No	Minimum of 3/plane	Minimum of 3/plane	10%

Notes

- (1) See attached map for building layout
- (2) Surveys are to be performed in accordance with 4-K62-ROI-03 01, *Performance of Surface Contamination Surveys*, with the exception that actual observed values will be recorded when measurements are below the instrument MDA. Surveys are to be performed on accessible surfaces including fixed equipment/systems paying particular attention to horizontal surfaces. Removable and Direct alpha/beta surveys will be performed prior to the required scan survey.
- (3) Perform an alpha scan (2 in/sec) and beta scan (4 in/sec) survey over the percentage of the accessible surfaces as listed, including fixed equipment/systems, paying particular attention to horizontal surfaces. Scan surveys are performed in areas having the highest potential for residual radioactivity. Document scan surveys by performing direct and removable alpha/beta measurements at locations where the net count rate corresponds to a level which equals the Derived Concentration Guideline Level (DCGL) (16 cpm alpha and 245 cpm beta for the NE Electra with DP6BD Probe). If previously obtained fixed and removable contamination surveys adequately document the scan, no further measurements are necessary. If no readings in excess of the DCGL were obtained during the scan, document this fact on the survey map cover sheet, further documentation is not required. Record direct and removable alpha/beta measurements obtained during the scan survey in accordance with Note (2) above.
- (4) A minimum of 45 fixed and removable data points will be obtained for each Survey Unit.

GROUP 15

Group 15 consists of Rooms 109, 109A, and 109B in Building 123. Rooms 109, 109A and 109B were at one time a single room used to store chemicals and samples. This room was later subdivided into three areas, Room 109 being last used as the building's breakroom. During the Historical Site Assessment, it was determined that a cesium spill had occurred in this area and was confined to the floor. During scoping and characterization surveys in-situ gamma spectroscopy confirmed this spill. The following classifications, grid criteria and survey densities apply.

Radiological Surveys ⁽²⁾ (4)						
Survey Unit	Area ⁽¹⁾	Class	Grid	# Removable alpha / beta survey measurements	# Direct alpha / beta survey measurements	Scan Survey ⁽³⁾
32	Floors	1	3' x 3'	Minimum of 1/grd	Minimum of 1/grd	100%
33	Wall (< 2 m)	2	3' x 3'	Minimum of 1/grd	Minimum of 1/grd	75%
34	Wall (> 2 m) Ceiling	3	No	Minimum of 3/plane	Minimum of 3/plane	10%

Notes

- (1) See attached map for building layout
- (2) Surveys are to be performed in accordance with 4-K62-ROI-03 01, *Performance of Surface Contamination Surveys*, with the exception that actual observed values will be recorded when measurements are below the instrument MDA. Surveys are to be performed on accessible surfaces including fixed equipment/systems paying particular attention to horizontal surfaces. Removable and Direct alpha/beta surveys will be performed prior to the required scan survey.
- (3) Perform an alpha scan (2 in/sec) and beta scan (4 in/sec) survey over the percentage of the accessible surfaces as listed, including fixed equipment/systems, paying particular attention to horizontal surfaces. Scan surveys are performed in areas having the highest potential for residual radioactivity. Document scan surveys by performing direct and removable alpha/beta measurements at locations where the net count rate corresponds to a level which equals the Derived Concentration Guideline Level (DCGL) (16 cpm alpha and 245 cpm beta for the NE Electra with DP6BD Probe). If previously obtained fixed and removable contamination surveys adequately document the scan, no further measurements are necessary. If no readings in excess of the DCGL were obtained during the scan, document this fact on the survey map cover sheet, further documentation is not required. Record direct and removable alpha/beta measurements obtained during the scan survey in accordance with Note (2) above.
- (4) A minimum of 45 fixed and removable data points will be obtained for each Survey Unit.

GROUP 16

Group 16 consists of Rooms 111 and 112 in Building 123. Room 111 was used as a bacteriology and beryllium analysis laboratory. Room 112 was used as a special environmental laboratory, all soil work was performed in this room. Room 112 was also used as a secondary storage area for bioassay samples. Historically, Room 112 was used in dog autopsy studies. Because the potential for and extent of residual radioactivity varies throughout this area, Group 16 has been subdivided into three survey units. The floors have been designated as Class 1 since they are expected to have the greatest potential for residual radioactivity in excess of the DCGLw. The walls below 2 meters have been designated as Class 2 based on the operating history, and the potential for residual radioactivity to exist below the DCGLw. The walls above 2 meters and the ceiling are not expected to contain residual radioactivity and have been designated as Class 3. Classifications, grid criteria and survey densities are summarized below.

Radiological Surveys ⁽²⁾ (4)						
Survey Unit	Area ⁽¹⁾	Class	Grid	# Removable alpha / beta survey measurements	# Direct alpha / beta survey measurements	Scan Survey ⁽³⁾
35	Floors	1	3' x 3'	Minimum of 1/grid	Minimum of 1/grid	100%
36	Wall (< 2 m)	2	3' x 3'	Minimum of 1/grid	Minimum of 1/grid	75%
37	Wall (> 2 m) Ceiling	3	No	Minimum of 3/plane	Minimum of 3/plane	10%

Notes

- (1) See attached map for building layout
- (2) Surveys are to be performed in accordance with 4-K62-ROI-03 01, *Performance of Surface Contamination Surveys*, with the exception that actual observed values will be recorded when measurements are below the instrument MDA. Surveys are to be performed on accessible surfaces including fixed equipment/systems paying particular attention to horizontal surfaces. Removable and Direct alpha/beta surveys will be performed prior to the required scan survey.
- (3) Perform an alpha scan (2 in/sec) and beta scan (4 in/sec) survey over the percentage of the accessible surfaces as listed, including fixed equipment/systems, paying particular attention to horizontal surfaces. Scan surveys are performed in areas having the highest potential for residual radioactivity. Document scan surveys by performing direct and removable alpha/beta measurements at locations where the net count rate corresponds to a level which equals the Derived Concentration Guideline Level (DCGL) (16 cpm alpha and 245 cpm beta for the NE Electra with DP6BD Probe). If previously obtained fixed and removable contamination surveys adequately document the scan, no further measurements are necessary. If no readings in excess of the DCGL were obtained during the scan, document this fact on the survey map cover sheet, further documentation is not required. Record direct and removable alpha/beta measurements obtained during the scan survey in accordance with Note (2) above.
- (4) A minimum of 45 fixed and removable data points will be obtained for each Survey Unit.

GROUP 17

Group 17 consists of Rooms 124 and 125 in Building 123. Room 124 was used for the final stages of electroplating environmental and bioassay samples. Room 125 was used as the standard bioassay sample preparation area. Because the potential for and extent of residual radioactivity varies throughout this area, Group 17 has been subdivided into three survey units. The floors have been designated as Class 1 since they are expected to have the greatest potential for residual radioactivity in excess of the DCGLw. The walls below 2 meters have been designated as Class 2 based on the operating history, and the potential for residual radioactivity to exist below the DCGLw. The walls above 2 meters and the ceiling are not expected to contain residual radioactivity and have been designated as Class 3. Classifications, grid criteria and survey densities are summarized below.

Radiological Surveys ^{(2) (4)}						
Survey Unit	Area ⁽¹⁾	Class	Grid	# Removable alpha / beta survey measurements	# Direct alpha / beta survey measurements	Scan Survey ⁽³⁾
38	Floors	1	3' x 3'	Minimum of 1/grd	Minimum of 1/grd	100%
39	Wall (< 2 m)	2	3' x 3'	Minimum of 1/grd	Minimum of 1/grd	75%
40	Wall (> 2 m) Ceiling	3	No	Minimum of 3/plane	Minimum of 3/plane	10%

Notes

- (1) See attached map for building layout
- (2) Surveys are to be performed in accordance with 4-K62-ROI-03 01, *Performance of Surface Contamination Surveys*, with the exception that actual observed values will be recorded when measurements are below the instrument MDA. Surveys are to be performed on accessible surfaces including fixed equipment/systems paying particular attention to horizontal surfaces. Removable and Direct alpha/beta surveys will be performed prior to the required scan survey.
- (3) Perform an alpha scan (2 in/sec) and beta scan (4 in/sec) survey over the percentage of the accessible surfaces as listed, including fixed equipment/systems, paying particular attention to horizontal surfaces. Scan surveys are performed in areas having the highest potential for residual radioactivity. Document scan surveys by performing direct and removable alpha/beta measurements at locations where the net count rate corresponds to a level which equals the Derived Concentration Guideline Level (DCGL) (16 cpm alpha and 245 cpm beta for the NE Electra with DP6BD Probe). If previously obtained fixed and removable contamination surveys adequately document the scan, no further measurements are necessary. If no readings in excess of the DCGL were obtained during the scan, document this fact on the survey map cover sheet, further documentation is not required. Record direct and removable alpha/beta measurements obtained during the scan survey in accordance with Note (2) above.
- (4) A minimum of 45 fixed and removable data points will be obtained for each Survey Unit.

GROUP 18

Group 18 consists of Rooms 126, 126B, 126C, and 127 in Building 123. Gas chromatography was performed in the 126 area. An office and storage room is also included in this group. Room 127 was used for the final stages of electroplating environmental and bioassay samples. Because the potential for and extent of residual radioactivity varies throughout this area, Group 18 has been subdivided into three survey units. The floors have been designated as Class 1 since they are expected to have the greatest potential for residual radioactivity in excess of the DCGL_w. The walls below 2 meters have been designated as Class 2 based on the operating history, and the potential for residual radioactivity to exist below the DCGL_w. The walls above 2 meters and the ceiling are not expected to contain residual radioactivity and have been designated as Class 3. Classifications, grid criteria and survey densities are summarized below:

Radiological Surveys ^{(2) (4)}						
Survey Unit	Area ⁽¹⁾	Class	Grid	# Removable alpha / beta survey measurements	# Direct alpha / beta survey measurements	Scan Survey ⁽³⁾
41	Floors	1	3' x 3'	Minimum of 1/grid	Minimum of 1/grid	100%
42	Wall (< 2 m)	2	3' x 3'	Minimum of 1/grid	Minimum of 1/grid	75%
43	Wall (> 2 m) Ceiling	3	No	Minimum of 3/plane	Minimum of 3/plane	10%

Notes

- (1) See attached map for building layout
- (2) Surveys are to be performed in accordance with 4-K62-ROI-03 01, *Performance of Surface Contamination Surveys*, with the exception that actual observed values will be recorded when measurements are below the instrument MDA. Surveys are to be performed on accessible surfaces including fixed equipment/systems paying particular attention to horizontal surfaces. Removable and Direct alpha/beta surveys will be performed prior to the required scan survey.
- (3) Perform an alpha scan (2 in/sec) and beta scan (4 in/sec) survey over the percentage of the accessible surfaces as listed, including fixed equipment/systems, paying particular attention to horizontal surfaces. Scan surveys are performed in areas having the highest potential for residual radioactivity. Document scan surveys by performing direct and removable alpha/beta measurements at locations where the net count rate corresponds to a level which equals the Derived Concentration Guideline Level (DCGL) (16 cpm alpha and 245 cpm beta for the NE Electra with DP6BD Probe). If previously obtained fixed and removable contamination surveys adequately document the scan, no further measurements are necessary. If no readings in excess of the DCGL were obtained during the scan, document this fact on the survey map cover sheet, further documentation is not required. Record direct and removable alpha/beta measurements obtained during the scan survey in accordance with Note (2) above.
- (4) A minimum of 45 fixed and removable data points will be obtained for each Survey Unit.

GROUP 19

Group 19 consists of Room 156, 157, and 158 in Building 123. Rooms 156 and 157 were used for the initial preparation of environmental samples. Historically, Room 156 was used for the analysis of samples obtained during human autopsies. Room 158 functioned as the primary receiving point for radioactive and non-radioactive materials coming into Building 123. Because the potential for and extent of residual radioactivity varies throughout this area, Group 19 has been subdivided into three survey units. The floors have been designated as Class 1 since they are expected to have the greatest potential for residual radioactivity in excess of the DCGL_w. The walls below 2 meters have been designated as Class 2 based on the operating history, and the potential for residual radioactivity to exist below the DCGL_w. The walls above 2 meters and the ceiling are not expected to contain residual radioactivity and have been designated Class 3. Classifications, grid criteria and survey densities are summarized below.

Radiological Surveys ⁽²⁾ (4)						
Survey Unit	Area ⁽¹⁾	Class	Grid	# Removable alpha / beta survey measurements	# Direct alpha / beta survey measurements	Scan Survey ⁽³⁾
44	Floors	1	3' x 3'	Minimum of 1/grd	Minimum of 1/grd	100%
45	Wall (< 2 m)	2	3' x 3'	Minimum of 1/grd	Minimum of 1/grd	75%
46	Wall (> 2 m) Ceiling	3	No	Minimum of 3/plane	Minimum of 3/plane	10%

Notes

- (1) See attached map for building layout
- (2) Surveys are to be performed in accordance with 4-K62-ROI-03 01, *Performance of Surface Contamination Surveys*, with the exception that actual observed values will be recorded when measurements are below the instrument MDA. Surveys are to be performed on accessible surfaces including fixed equipment/systems paying particular attention to horizontal surfaces. Removable and Direct alpha/beta surveys will be performed prior to the required scan survey.
- (3) Perform an alpha scan (2 in/sec) and beta scan (4 in/sec) survey over the percentage of the accessible surfaces as listed, including fixed equipment/systems, paying particular attention to horizontal surfaces. Scan surveys are performed in areas having the highest potential for residual radioactivity. Document scan surveys by performing direct and removable alpha/beta measurements at locations where the net count rate corresponds to a level which equals the Derived Concentration Guideline Level (DCGL) (16 cpm alpha and 245 cpm beta for the NE Electra with DP6BD Probe). If previously obtained fixed and removable contamination surveys adequately document the scan, no further measurements are necessary. If no readings in excess of the DCGL were obtained during the scan, document this fact on the survey map cover sheet, further documentation is not required. Record direct and removable alpha/beta measurements obtained during the scan survey in accordance with Note (2) above.
- (4) A minimum of 45 fixed and removable data points will be obtained for each Survey Unit.

GROUP 20

Group 20 consists of the North, West, East, and South Halls in Building 123 The following classifications, grid criteria and survey densities apply

Radiological Surveys ⁽²⁾ (4)						
Survey Unit	Area ⁽¹⁾	Class	Grid	# Removable alpha / beta survey measurements	# Direct alpha / beta survey measurements	Scan Survey ⁽³⁾
47	Floors	2	3' x 3'	Minimum of 1/grd	Minimum of 1/grd	75%
48	Wall (< 2 m)	3	No	Minimum of 3/plane each 12 linear feet	Minimum of 3/plane each 12 linear feet	10%
	Wall (> 2 m) Ceiling	3	No	Minimum of 1/plane each 12 linear feet	Minimum of 1/plane each 12 linear feet	10%

Notes

- (1) See attached map for building layout
- (2) Surveys are to be performed in accordance with 4-K62-ROI-03 01, *Performance of Surface Contamination Surveys*, with the exception that actual observed values will be recorded when measurements are below the instrument MDA Surveys are to be performed on accessible surfaces including fixed equipment/systems paying particular attention to horizontal surfaces Removable and Direct alpha/beta surveys will be performed prior to the required scan survey
- (3) Perform an alpha scan (2 in/sec) and beta scan (4 in/sec) survey over the percentage of the accessible surfaces as listed, including fixed equipment/systems, paying particular attention to horizontal surfaces Scan surveys are performed in areas having the highest potential for residual radioactivity Document scan surveys by performing direct and removable alpha/beta measurements at locations where the net count rate corresponds to a level which equals the Derived Concentration Guideline Level (DCGL) (16 cpm alpha and 245 cpm beta for the NE Electra with DP6BD Probe) If previously obtained fixed and removable contamination surveys adequately document the scan, no further measurements are necessary If no readings in excess of the DCGL were obtained during the scan, document this fact on the survey map cover sheet, further documentation is not required Record direct and removable alpha/beta measurements obtained during the scan survey in accordance with Note (2) above
- (4) A minimum of 45 fixed and removable data points will be obtained for each Survey Unit

GROUP 21

Group 21 consists of a Pipe Chase located between the men's and women's locker rooms. This area is controlled as a confined space, entry is gained through a small door labeled 332-023 from the North hallway in Building 123. This area is not expected to contain residual radioactivity and has been designated as Class 3. Classification, grid criteria and survey densities are summarized below.

Radiological Surveys ⁽²⁾						
Survey Unit	Area ⁽¹⁾	Class	Grid	# Removable alpha / beta survey measurements	# Direct alpha / beta survey measurements	Scan Survey ⁽³⁾
49	Floors	3	No	Minimum of 45	Minimum of 45	10%
	Wall (< 2 m)	3	No	Minimum of 3/plane	Minimum of 3/plane	10%
	Wall (> 2 m) Ceiling	3	No	Minimum of 1/plane	Minimum of 1/plane	10%

Notes

- (1) See attached map for building layout.
- (2) Surveys are to be performed in accordance with 4-K62-ROI-03 01, *Performance of Surface Contamination Surveys*, with the exception that actual observed values will be recorded when measurements are below the instrument MDA. Surveys are to be performed on accessible surfaces including fixed equipment/systems paying particular attention to horizontal surfaces. Removable and Direct alpha/beta surveys will be performed prior to the required scan survey.
- (3) Perform an alpha scan (2 in/sec) and beta scan (4 in/sec) survey over the percentage of the accessible surfaces as listed, including fixed equipment/systems, paying particular attention to horizontal surfaces. Scan surveys are performed in areas having the highest potential for residual radioactivity. Document scan surveys by performing direct and removable alpha/beta measurements at locations where the net count rate corresponds to a level which equals the Derived Concentration Guideline Level (DCGL) (16 cpm alpha and 245 cpm beta for the NE Electra with DP6BD Probe). If previously obtained fixed and removable contamination surveys adequately document the scan, no further measurements are necessary. If no readings in excess of the DCGL were obtained during the scan, document this fact on the survey map cover sheet, further documentation is not required. Record direct and removable alpha/beta measurements obtained during the scan survey in accordance with Note (2) above.

GROUP 22

Group 22 consists of three process waste sumps, located in Rooms 156, 157 and 158 in Building 123. These sumps are controlled as confined spaces and have not been entered for the purposes of characterization. The potential exists for these areas to contain residual radioactivity in excess of the DCGL_w and have been designated as Class 1. Classification, grid criteria and survey densities are summarized below.

Radiological Surveys(2) (4)						
Survey Unit	Area(1)	Class	Grid	# Removable alpha / beta survey measurements	# Direct alpha / beta survey measurements	Scan Survey(3)
50	Floors	1	3' x 3'	Minimum of 1/grid	Minimum of 1/grid	100%
	Walls	1	3' x 3'	Minimum of 5/plane	Minimum of 5/plane	100%

Notes

- (1) See attached map for building layout
- (2) Surveys are to be performed in accordance with 4-K62-ROI-03 01, *Performance of Surface Contamination Surveys*, with the exception that actual observed values will be recorded when measurements are below the instrument MDA. Surveys are to be performed on accessible surfaces including fixed equipment/systems paying particular attention to horizontal surfaces. Removable and Direct alpha/beta surveys will be performed prior to the required scan survey.
- (3) Perform an alpha scan (2 in/sec) and beta scan (4 in/sec) survey over the percentage of the accessible surfaces as listed, including fixed equipment/systems, paying particular attention to horizontal surfaces. Scan surveys are performed in areas having the highest potential for residual radioactivity. Document scan surveys by performing direct and removable alpha/beta measurements at locations where the net count rate corresponds to a level which equals the Derived Concentration Guideline Level (DCGL) (16 cpm alpha and 245 cpm beta for the NE Electra with DP6BD Probe). If previously obtained fixed and removable contamination surveys adequately document the scan, no further measurements are necessary. If no readings in excess of the DCGL were obtained during the scan, document this fact on the survey map cover sheet, further documentation is not required. Record direct and removable alpha/beta measurements obtained during the scan survey in accordance with Note (2) above.
- (4) A minimum of 45 fixed and removable data points will be obtained for the entire Survey Unit.

GROUP 23

Group 23 consists of the interiors in Buildings 113 and 114. Building 113 is a guardhouse that has been converted into office space. The building encloses approximately 200 square feet. Building 114 is a small shelter used by RFETS employees as a waiting area for off-site transportation. The building encloses approximately 25 square feet. It is constructed of masonry blocks with a flat roof. There are no utilities associated with this building, and records indicate the building has served no other function. Residual radioactivity is not expected in either of these buildings; therefore, both buildings have been designated as Class 3. Classification, grid criteria and survey densities are summarized below.

Radiological Surveys ⁽²⁾ (4)						
Survey Unit	Area ⁽¹⁾	Class	Grid	# Removable alpha / beta survey measurements	# Direct alpha / beta survey measurements	Scan Survey ⁽³⁾
51	Floors	3	No	Minimum of 30 - B 113 Minimum of 15 - B 114	Minimum of 30 - B 113 Minimum of 15 - B 114	10%
	Wall (< 2 m)	3	No	Minimum of 3/plane	Minimum of 3/plane	10%
	Wall (> 2 m) Ceiling	3	No	Minimum of 1/plane	Minimum of 1/plane	10%

Notes

- (1) See attached map for building layout.
- (2) Surveys are to be performed in accordance with 4-K62-ROI-03 01, *Performance of Surface Contamination Surveys*, with the exception that actual observed values will be recorded when measurements are below the instrument MDA. Surveys are to be performed on accessible surfaces including fixed equipment/systems paying particular attention to horizontal surfaces. Removable and Direct alpha/beta surveys will be performed prior to the required scan survey.
- (3) Perform an alpha scan (2 in/sec) and beta scan (4 in/sec) survey over the percentage of the accessible surfaces as listed, including fixed equipment/systems, paying particular attention to horizontal surfaces. Scan surveys are performed in areas having the highest potential for residual radioactivity. Document scan surveys by performing direct and removable alpha/beta measurements at locations where the net count rate corresponds to a level which equals the Derived Concentration Guideline Level (DCGL) (16 cpm alpha and 245 cpm beta for the NE Electra with DP6BD Probe). If previously obtained fixed and removable contamination surveys adequately document the scan, no further measurements are necessary. If no readings in excess of the DCGL were obtained during the scan, document this fact on the survey map cover sheet; further documentation is not required. Record direct and removable alpha/beta measurements obtained during the scan survey in accordance with Note (2) above.
- (4) A minimum of 30 fixed and removable data points will be obtained for each Survey Unit.

GROUP 24

Group 24 consists of the Building 123 room non-process ventilation system which handled routine HVAC. The building ventilation system is not expected to contain residual radioactivity and has been designated as Class 3. Classification, grid criteria and survey densities are summarized below.

Radiological Surveys ⁽²⁾						
Survey Unit	Area ⁽¹⁾	Class	Grid	# Removable alpha / beta survey measurements	# Direct alpha / beta survey measurements	Scan Survey ⁽³⁾
52	System	3	No	Minimum of 45	Minimum of 45	10%

Notes

- (1) See attached map for building layout
- (2) Surveys are to be performed in accordance with 4-K62-ROI-03 01, *Performance of Surface Contamination Surveys*, with the exception that actual observed values will be recorded when measurements are below the instrument MDA. Surveys are to be performed on accessible surfaces including fixed equipment/systems paying particular attention to horizontal surfaces. Removable and Direct alpha/beta surveys will be performed prior to the required scan survey.
- (3) Perform an alpha scan (2 in/sec) and beta scan (4 in/sec) survey over the percentage of the accessible surfaces as listed, including fixed equipment/systems, paying particular attention to horizontal surfaces. Scan surveys are performed in areas having the highest potential for residual radioactivity. Document scan surveys by performing direct and removable alpha/beta measurements at locations where the net count rate corresponds to a level which equals the Derived Concentration Guideline Level (DCGL) (16 cpm alpha and 245 cpm beta for the NE Electra with DP6BD Probe). If previously obtained fixed and removable contamination surveys adequately document the scan, no further measurements are necessary. If no readings in excess of the DCGL were obtained during the scan, document this fact on the survey map cover sheet, further documentation is not required. Record direct and removable alpha/beta measurements obtained during the scan survey in accordance with Note (2) above.

GROUP 25

Group 25 consists of sanitary drains. The sanitary drains are not expected to contain residual radioactivity in excess of the release criteria. Classification, grid criteria and survey densities are summarized below.

Radiological Surveys ⁽²⁾						
Survey Unit	Area ⁽¹⁾	Class	Grid	# Removable alpha / beta survey measurements	# Direct alpha / beta survey measurements	Scan Survey ⁽³⁾
53	System	3	No	Minimum of 45	Minimum of 45	10%

Notes

- (1) See attached map for building layout.
- (2) Surveys are to be performed in accordance with 4-K62-ROI-03 01, *Performance of Surface Contamination Surveys*, with the exception that actual observed values will be recorded when measurements are below the instrument MDA. Surveys are to be performed on accessible surfaces including fixed equipment/systems paying particular attention to horizontal surfaces. Removable and Direct alpha/beta surveys will be performed prior to the required scan survey.
- (3) Perform an alpha scan (2 in/sec) and beta scan (4 in/sec) survey over the percentage of the accessible surfaces as listed, including fixed equipment/systems, paying particular attention to horizontal surfaces. Scan surveys are performed in areas having the highest potential for residual radioactivity. Document scan surveys by performing direct and removable alpha/beta measurements at locations where the net count rate corresponds to a level which equals the Derived Concentration Guideline Level (DCGL) (16 cpm alpha and 245 cpm beta for the NE Electra with DP6BD Probe). If previously obtained fixed and removable contamination surveys adequately document the scan, no further measurements are necessary. If no readings in excess of the DCGL were obtained during the scan, document this fact on the survey map cover sheet, further documentation is not required. Record direct and removable alpha/beta measurements obtained during the scan survey in accordance with Note (2) above.

GROUP 26

Group 26 consists of the exterior in Building 123. The exterior of Building 123 is not expected to contain residual radioactivity and has been designated Class 3. Classification, grid criteria and survey densities are summarized below.

Radiological Surveys ⁽²⁾						
Survey Unit	Area ⁽¹⁾	Class	Grid	# Removable alpha / beta survey measurements	# Direct alpha / beta survey measurements	Scan Survey ⁽³⁾
54	Exterior walls	3	No	Minimum of 90/wing	Minimum of 90/wing	10%
	Roof	3	No	Minimum of 90/wing	Minimum of 90/wing	10%
	Supply Ventilation Plenums (3)	3	No	Minimum of 15/plenum (interior)	Minimum of 15/plenum (interior)	10%

Notes

- (1) See attached map for building layout
- (2) Surveys are to be performed in accordance with 4-K62-ROI-03 01, *Performance of Surface Contamination Surveys*, with the exception that actual observed values will be recorded when measurements are below the instrument MDA. Surveys are to be performed on accessible surfaces including fixed equipment/systems paying particular attention to horizontal surfaces. Removable and Direct alpha/beta surveys will be performed prior to the required scan survey.
- (3) Perform an alpha scan (2 in/sec) and beta scan (4 in/sec) survey over the percentage of the accessible surfaces as listed, including fixed equipment/systems, paying particular attention to horizontal surfaces. Scan surveys are performed in areas having the highest potential for residual radioactivity. Document scan surveys by performing direct and removable alpha/beta measurements at locations where the net count rate corresponds to a level which equals the Derived Concentration Guideline Level (DCGL) (16 cpm alpha and 1300 cpm beta for the NE Electra with DP6BD Probe). If previously obtained fixed and removable contamination surveys adequately document the scan, no further measurements are necessary. If no readings in excess of the DCGL were obtained during the scan, document this fact on the survey map cover sheet, further documentation is not required. Record direct and removable alpha/beta measurements obtained during the scan survey in accordance with Note (2) above.

GROUP 27

Group 27 consists of the exterior of Building 113. The exterior of Building 113 is not expected to contain residual radioactivity and has been designated Class 3. Classification, grid criteria and survey densities are summarized below.

Radiological Surveys ⁽²⁾						
Survey Unit	Area ⁽¹⁾	Class	Grid	# Removable alpha / beta survey measurements	# Direct alpha / beta survey measurements	Scan Survey ⁽³⁾
55	Exterior walls	3	No	Minimum of 5/plane	Minimum of 5/plane	10%
	Roof	3	No	Minimum of 10	Minimum of 10	10%

Notes

- (1) See attached map for building layout.
- (2) Surveys are to be performed in accordance with 4-K62-ROI-03 01, *Performance of Surface Contamination Surveys*, with the exception that actual observed values will be recorded when measurements are below the instrument MDA. Surveys are to be performed on accessible surfaces including fixed equipment/systems paying particular attention to horizontal surfaces. Removable and Direct alpha/beta surveys will be performed prior to the required scan survey.
- (3) Perform an alpha scan (2 in/sec) and beta scan (4 in/sec) survey over the percentage of the accessible surfaces as listed, including fixed equipment/systems, paying particular attention to horizontal surfaces. Scan surveys are performed in areas having the highest potential for residual radioactivity. Document scan surveys by performing direct and removable alpha/beta measurements at locations where the net count rate corresponds to a level which equals the Derived Concentration Guideline Level (DCGL) (16 cpm alpha and 1300 cpm beta for the NE Electra with DP6BD Probe). If previously obtained fixed and removable contamination surveys adequately document the scan, no further measurements are necessary. If no readings in excess of the DCGL were obtained during the scan, document this fact on the survey map cover sheet, further documentation is not required. Record direct and removable alpha/beta measurements obtained during the scan survey in accordance with Note (2) above.

GROUP 28

Group 28 consists of the exterior of Building 114. The exterior of Building 114 is not expected to contain residual radioactivity and has been designated Class 3. Classification, grid criteria and survey densities are summarized below.

Radiological Surveys ⁽²⁾						
Survey Unit	Area ⁽¹⁾	Class	Grid	# Removable alpha / beta survey measurements	# Direct alpha / beta survey measurements	Scan Survey ⁽³⁾
56	Exterior walls	3	No	Minimum of 5/plane	Minimum of 5/plane	10%
	Roof	3	No	Minimum of 10	Minimum of 10	10%

Notes

- (1) See attached map for building layout.
- (2) Surveys are to be performed in accordance with 4-K62-ROI-03 01, *Performance of Surface Contamination Surveys*, with the exception that actual observed values will be recorded when measurements are below the instrument MDA. Surveys are to be performed on accessible surfaces including fixed equipment/systems paying particular attention to horizontal surfaces. Removable and Direct alpha/beta surveys will be performed prior to the required scan survey.
- (3) Perform an alpha scan (2 in/sec) and beta scan (4 in/sec) survey over the percentage of the accessible surfaces as listed, including fixed equipment/systems, paying particular attention to horizontal surfaces. Scan surveys are performed in areas having the highest potential for residual radioactivity. Document scan surveys by performing direct and removable alpha/beta measurements at locations where the net count rate corresponds to a level which equals the Derived Concentration Guideline Level (DCGL) (16 cpm alpha and 1300 cpm beta for the NE Electra with DP6BD Probe). If previously obtained fixed and removable contamination surveys adequately document the scan, no further measurements are necessary. If no readings in excess of the DCGL were obtained during the scan, document this fact on the survey map cover sheet; further documentation is not required. Record direct and removable alpha/beta measurements obtained during the scan survey in accordance with Note (2) above.

Attachment 1.0
Correspondence

United States Government

Department of Energy

Rocky Flats Field Office

memorandum

DATE: DEC 5 1997
REPLY TO:
ATTN OF: AME-ESD TPD 04909
SUBJECT: Surface Contamination Guidelines for Building 123
TO: Wynn A. Harding, Vice President
Safety Systems and Engineering
Kaiser-Hill Company, L.L.C.

Reference: Memo, Harding to Lowe, #97-RF-05729, subject: DOE Order 5400.5 Figure IV-1 - Surface Contamination Guidelines and the Application of These Limits Towards Naturally Radioactive Decay Chains and the Ingrowth of Progeny from Purified Naturally Occurring Radioisotopes - WAH-351-97, dtd 11/4/97

The DOE personnel in both the Assistant Manager for Engineering and the Assistant Manager for Performance Assessment offices have reviewed the referenced memorandum and the Safe Sites of Colorado Interoffice Correspondence "Derived Contamination Guide Level for Beta Contamination During Final Surveys of the Interior of Building 123 - JJM-111-97". Based on this review, I acknowledge and concur with the Kaiser-Hill Company, L.L.C.'s interpretation of DOE Order 5400.5 Figure IV-1, *Surface Contamination Guidelines* with regard to contamination resulting from naturally occurring radioactive decay chains and contamination from the ingrowth of progeny from purified naturally occurring radioisotopes (specifically natural Thorium and Th232).

This does not authorize any changes to release criteria established in Table 2-2 of DOE/EH-0256T U.S. Department of Energy Radiological Control Manual.

This technical direction is not intended to impact the cost, scope or schedule to the contract. If you believe there will be such an impact, you should immediately notify the Contracting Officer's Representative and the Contracting Officer and not implement the technical direction received. If you require additional information please contact me at extension 5878 or Tom Denny at extension 6619.



Keith A. Klein
Deputy Manager for Technical Programs

cc
L Lewis, AMGO, RFFO
T Denny, ESD, RFFO
P Psomas, TAD, RFFO
D Parsons, SHFSD, RFFO



Rocky Flats Environmental Technology Site

INTEROFFICE CORRESPONDENCE

DATE. November 18, 1997

TO

File

FROM

J Miller, Radiological Engineering, Bldg T130B, X2454

SUBJECT

DERIVED CONTAMINATION GUIDE LEVEL (DCGL) FOR BETA CONTAMINATION
DURING FINAL SURVEYS OF THE INTERIOR OF BUILDING 123 - JJM-111-97

During reconnaissance level characterization surveys, fixed beta contamination was detected in the building hallways and in some of the laboratories. With levels up to 124,000 dpm /100 cm², Room 105 was determined to be the most highly contaminated area in the building. It is assumed that the contamination identified in the hallways originated in Room 105 and was spread throughout the building via personnel. Interviews with building occupants suggested that research with thorium had occurred in Room 105 approximately 10 to 12 years prior. In-situ gamma spectroscopy identified the presence of Th-232 through the measurement of Ac-228, its second decay product. While Th-232 is an alpha emitter, there was no alpha contamination detected in areas with elevated beta contamination. This leads to two possibilities (1) Th-232 is not present and the source of contamination is from Ra-228, a low energy beta emitter and parent to Ac-228, or (2) the activity that was once dispersed across the floor tiles had been worn off through years of foot traffic and the only activity remaining is confined to the floor tile joints where a collection of dirt completely attenuate the Th-232 alpha but does not attenuate the beta particles emitted from Ac-228. The second scenario is most likely in that, the historical site assessment did not identify the use of Ra-228 in past building processes and the contamination pattern follows the tile joints.

Gross alpha contamination surveys will be used to verify the building is free of contamination resulting from Pu-239. Since the release criteria for Pu-239 is an order of magnitude less than the Th-232 release criteria and the alpha particles emitted from Th-232 have gone undetected, an alternative method of verifying the release criteria for Th-232 is needed in order to complete final surveys. Assuming Th-232 was present in a purified form, the Th-232 activity can be calculated knowing the time it has decayed and the Ac-228 activity. The Th-232 release criteria will be verified by measuring the beta emission from the Ac-228 and applying a correction factor that accounts for the incomplete ingrowth of Ac-228 from Th-232 to the Th-232 release criteria. A factor of 0.75 has been applied based on the activity ratio calculated using RadDecay Version 4.0, output attached. This factor is conservative in that it assumes all of the activity was deposited between 10 to 12 years ago from a single incident. This assumption does not take into account the ingrowth of Ac-228 which would have occurred if the Th-232 contamination resulted from a series of events occurring over the duration of Th-232 use.

**Attachments As
Stated (2)**

jjm

cc

J B Barroso

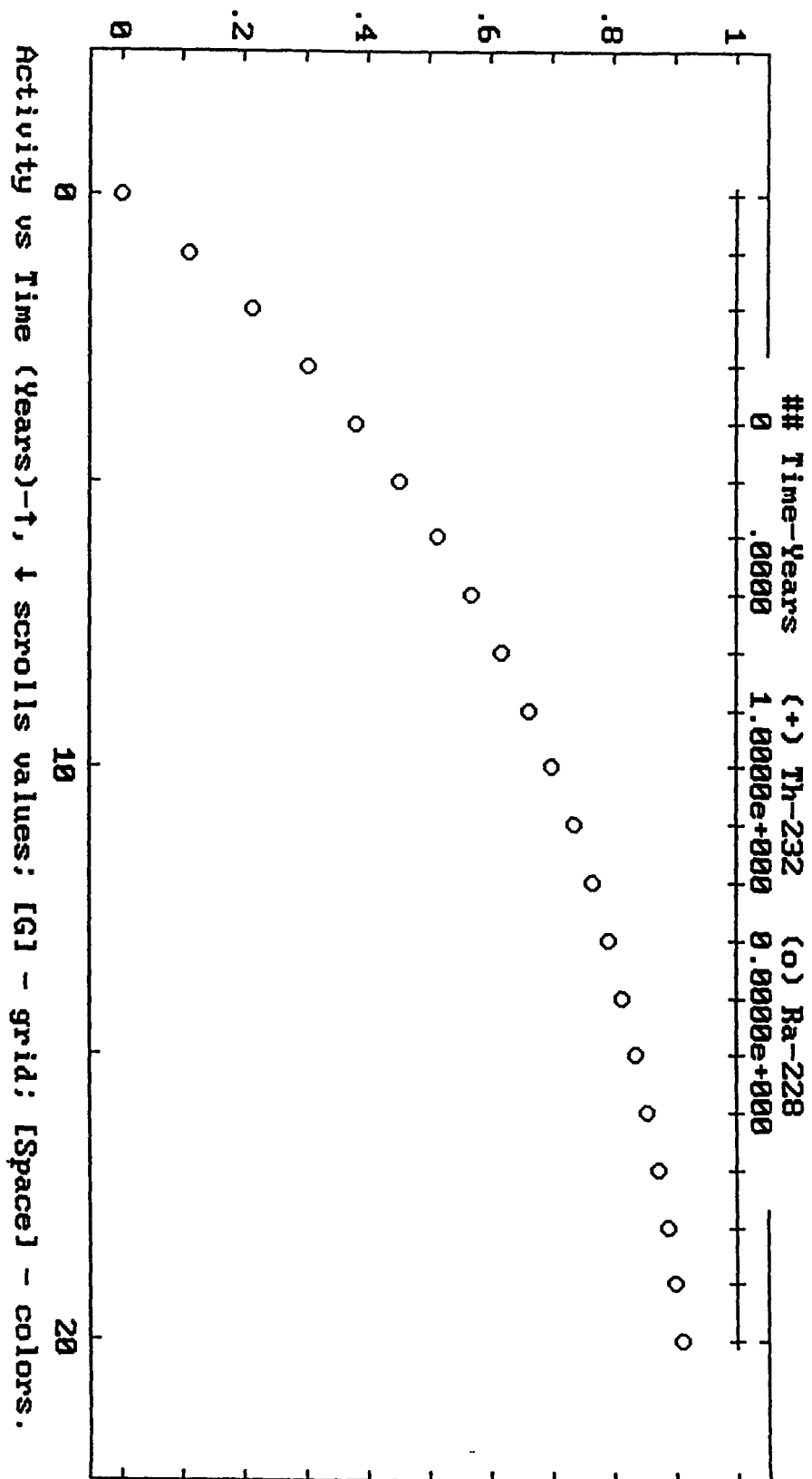
R D Johnson

Result of decaying 1 Curie of Th-232
Decay time of 10 years = 3,652.50 days

Nuclide	HalfLife	Branching from parent	Fraction	Curies
Th-232	1 4050e+010 Years	[parent]	1.0000e+000	1 0000e+000
Ra-228	5 7500e+000 Years	1.00000	7.0045e-001	7 0045e-001
Ac-228	6 1300e+000 Hours	1.00000	7.0041e-001	7 0041e-001
Th-228	1 9132e+000 Years	1.00000	5.6435e-001	5 6435e-001
Ra-224	3.6200e+000 Days	1 00000	5.6364e-001	5.6364e-001
Rn-220	5 5610e+001 Seconds	1.00000	5.6364e-001	5.6364e-001
Po-216	1.4600e-001 Seconds	1.00000	5.6364e-001	5 6364e-001
Pb-212	1.0643e+001 Hours	1.00000	5.6355e-001	5.6355e-001
Bi-212	6.0550e+001 Minutes	1.00000	5.6355e-001	5.6355e-001
Tl-208	3 0530e+000 Minutes	.35930	2.0248e-001	2 0248e-001
Po-212	2 9800e-007 Seconds	.64070	3.6106e-001	3 6106e-001

Result of decaying 1 Curie of Th-232
Decay time of 12 years = 4,383.00 days

Nuclide	HalfLife	Branching from parent	Fraction	Curies
Th-232	1.4050e+010 Years	[parent]	1.0000e+000	1.0000e+000
Ra-228	5.7500e+000 Years	1.00000	7.6462e-001	7.6462e-001
Ac-228	6 1300e+000 Hours	1.00000	7.6459e-001	7.6459e-001
Th-228	1.9132e+000 Years	1.00000	6.5366e-001	6.5366e-001
Ra-224	3.6200e+000 Days	1.00000	6.5309e-001	6.5309e-001
Rn-220	5.5610e+001 Seconds	1.00000	6.5309e-001	6.5309e-001
Po-216	1.4600e-001 Seconds	1.00000	6.5309e-001	6.5309e-001
Pb-212	1.0643e+001 Hours	1.00000	6.5302e-001	6.5302e-001
Bi-212	6.0550e+001 Minutes	1.00000	6.5301e-001	6 5301e-001
Tl-208	3.0530e+000 Minutes	.35930	2.3463e-001	2.3463e-001
Po-212	2 9800e-007 Seconds	.64070	4.1838e-001	4.1838e-001



CORRES CONTROL
OUTGOING LTR NO

ORDER #5400.5

7-RF-05729

DIST	LTR	ENC
NSUSSEN, S J		
AJLSFORD M D		
HL A R		
RDGE, L		
RD R G		
RRERA, D W		
L J A		
LL, R E		
RTINEZ, L A		
RKER A M		
EARS, M S	X	
LER, R E		
OR, N R		
ORHEIS, G M		

November 4, 1997

97-RF-05729

David C Lowe
Assistant Manager for Engineering
DOE, RFFO

DEPARTMENT OF ENERGY (DOE) ORDER 5400.5 FIGURE IV-1 - SURFACE CONTAMINATION GUIDELINES AND THE APPLICATION OF THESE LIMITS TOWARDS NATURALLY RADIOACTIVE DECAY CHAINS AND THE INGROWTH OF PROGENY FROM PURIFIED NATURALLY OCCURRING RADIOISOTOPES - WAH-351-97

Kaiser-Hill requests that DOE, RFFO acknowledge and concur with Kaiser-Hill's interpretation of DOE 5400.5 Figure IV-1, *Surface Contamination Guidelines*. When the release limits for parent isotopes differ from that of their progeny, clarification is necessary to ensure the appropriated limits are utilized.

Kaiser-Hill's interpretation applies to facilities and equipment having residual surface contamination resulting from naturally occurring radioactive decay chains and from the ingrowth of progeny from purified naturally occurring radioisotopes. Of specific concern is natural thorium (Th-nat) and Th-232 which have been detected in Building 123 during the characterization survey.

To assure that the public and environment are protected from radioactive material at DOE facilities, the DOE promulgated DOE Order 5400.5. This Order applies to radioactive material released from operating DOE facilities and also to radioactive material left in place after a DOE facility has been decommissioned. Section IV, 4 a of this Order provides generic guidelines for residual concentrations of Ra-226, Ra-228, Th-230 and Th-232 in soil. These guidelines take into account ingrowth of radium from thorium and assume secular equilibrium between the two. Section IV, 4 d of this Order applies to surface contamination of existing structures and equipment. Generic surface contamination guidelines provided in Figure IV-1 fail to consider the secular equilibrium condition between Th-232 and Ra-228.

Kaiser-Hill interprets the allowable total residual surface contamination limits for Th-nat and Th-232 to include associated progeny. This interpretation is based on:

- 1 The allowable total residual surface contamination limits for Th-nat and Th-232 are an order of magnitude greater than thorium progeny, specifically Ra-228 and Th-228, which will be in or approaching secular equilibrium.
- 2 The limits associated with U-nat, U-235 and U-238 include associated decay products.

RRRES CONTROL	X	X
MIN RECD/080		
AFFIC		
TS/T130G		

CLASSIFICATION	
NI	X
CLASSIFIED	X
CONFIDENTIAL	
CRET	

AUTHORIZED CLASSIFIER
SIGNATURE
George A. Loeber
10/15/97 A/NH
REPLY TO RFP CC NO

ACTION ITEM STATUS	
<input type="checkbox"/>	PARTIAL/OPEN
<input type="checkbox"/>	CLOSED

LTR APPROVALS

ORIG & TYPIST INITIALS
JJM/cjb

16489 (Rev 2/28/97)



Kaiser-Hill Company, L.L.C.

Counter Address Rocky Flats Environmental Technology Site, State Hwy 93 and Cactus, Rocky Flats, CO 80007 • 303 966 7000
Mailing Address P.O. Box 464, Golden, Colorado 80402-0464

David C Lowe
November 4, 1997
97-RF-05729
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- 3 This interpretation is consistent with the generic guidelines for residual concentrations of Ra-226, Ra-228, Th-230 and Th-232 in soil

To release Building 123 for unrestricted use, alpha contamination will be verified less than the Category 1 release criteria of Figure IV-1 (20 dpm/100 cm² removable, 100 dpm/100 cm² total average and 300 dpm/100 cm² total maximum) which will be indicative of the residual radioactivity resulting from transuranic radionuclides. To account for the incomplete ingrowth of Th-232 progeny, beta contamination will be verified less than 75% of the Category 2 release criteria of Figure IV-1, (200 dpm/100 cm² removable, 1000 dpm/100 cm² total average and 3000 dpm/100 cm² total maximum), which will be indicative of the residual radioactivity resulting from Th-232 and Th-nat, through the measurement of Ac-228 in or approaching secular equilibrium with Ra-228 and Th-232.

It is requested that DOE, RFFO acknowledge and concur with this interpretation as soon as possible so that the Building 123 Deactivation and Decommission project can move forward. If you have any questions, please contact J J Miller at Extension 2454, or J B Barroso at Extension 8451.



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